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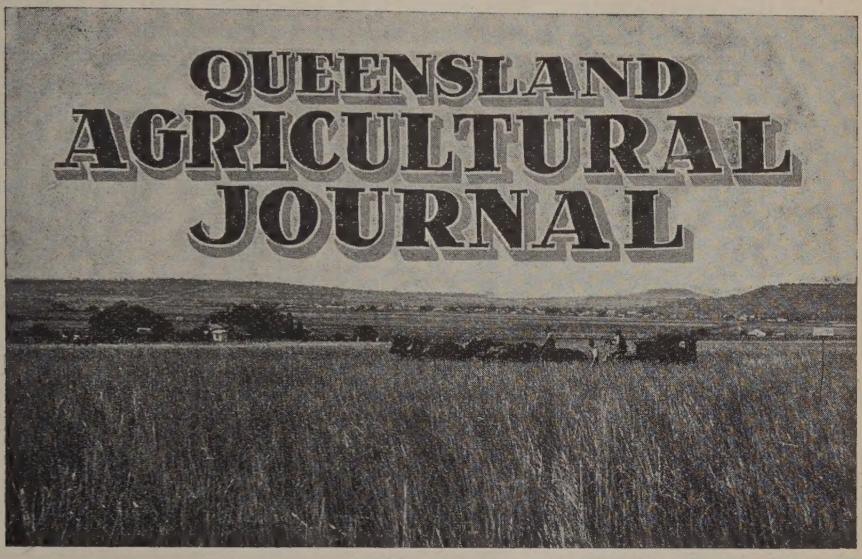

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Event and Comment.

Progress of the North.

ON his return from Cairns and Townsville, His Excellency the Governor, Sir Leslie Orme Wilson, said that he was impressed more than ever by the progress of the North. On every side there were indications of new development, and the people were looking forward with eager optimism.

At Townsville, he said, he was particularly pleased to have the opportunity of travelling along the Mount Spec road as far as it had been completed. He was taken by rail motor to Mongobulla and thence drove by car 9 miles up the mountain road. The road passed through glorious forest scenery, with wonderful distant views and some delightful wayside beauty spots, such as Saltwater Creek. When completed to the 3,000-feet summit of Mount Spec, the road would give a delightful summer resort to the people of Townsville. To him, however, its great importance lay in the fact that it was proposed to continue the road from the top of Mount Spec into the country beyond, and eventually to link up with Georgetown. When this was done the Gulf people would have another and nearer outlet to the coast. The road would open up valuable mineral country to the west of Townsville.

After opening a fine show at Townsville, the Governor went to Cairns and spent two days touring the Tableland district, which he first visited fourteen months ago. He was glad to have another chance of seeing this great country. He motored up the range road to Yungaburra, and thence to Herberton, Atherton, and Ravenshoe. Unfortunately, rain fell most of the time. The warm welcome he received, however, atoned for the weather's unkindness. On this visit he found that the season had not been very good, because of excessive rain, but, as always, there was a great feeling of optimism among the people.

From Cairns he travelled along the new Cook Highway to Mossman, where he spent a day. This road, like the Mount Spec road, is a fine piece of engineering, and he hoped that it would soon be extended to Cooktown. The scenery is magnificent, and without doubt will attract many tourists, but even without that the road is of the utmost value to the district, as it gives Mossman and Port Douglas direct road communication with Cairns. Mossman, which is as fertile as it is beautiful, is progressing remarkably, said His Excellency, in concluding an interesting comment on his visit to the North.

Britain and Dominion Trade.

SPEAKING at a function arranged in his honour by the Glasgow Chamber of Commerce, at Glasgow, on 18th June, the Premier of Queensland, Hon. W. Forgan Smith, said he felt positive that there was a definite public opinion among all people in Great Britain in favour of very close relations within the British Commonwealth of Nations. That was a very good thing. and spoke well for the future.

"It is important" he added, "that this unity within the Commonwealth should be made stronger and stronger as the years go on, because I believe that we have a mission to perform, that the world requires a lead in the interests of civilisation itself, and there is no organisation in the world to-day which could more effectively give that lead than the British Commonwealth of Nations."

On the question of trade, Mr. Smith said it had been suggested to them that their competition with the British farmer was reacting detrimentally to British interests. It had been suggested that Australian produce should be limited, and that they should be subject to quotas.

They in Australia were perturbed about such proposals, because they were contrary to the aim and purpose of the Australian people. First of all, they regarded them as bad economics.

He pointed out that in Australia there were hundreds of thousands of acres that were yet awaiting development. "In these circumstances," he added, "for us to agree to any policy of restriction would mean that we agreed to arrested development, that the unemployed should have no opportunity of getting work, and, more tragic than anything, that boys leaving school would not be absorbed into useful industry.

"We cannot agree to these things. We desire increased production, increased settlement, and increased developmnt of our own country. Furthermore, it must be realised that Australia is a debtor country. We must, therefore, meet our obligations in the form of export produce."

They were very proud of the fact, he observed, that Australia had met all its obligations on the due date. They were determined to continue to do so, but they must have the capacity to produce and the right to sell.

Dealing with the export of meat from Australia, Mr. Smith said it had been stated that such competition was detrimental to the growers of beef and mutton in Great Britain. Such was not the case. Australia competed not with the British farmer but with foreign countries. Britain definitely imported more from foreign countries than from the Dominions and Crown colonies, so that their competition in British markets was not with the British farmer but with the producers in foreign countries.

When they talked of trade within the Empire they in Australia were not asking for anything they were not prepared themselves to give. Their imports from Britain were increasing rapidly as the result of the Ottawa Conference.

Restriction of Exports.

ADDRESSING a large gathering of producers at Nambour last month, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that the question of the limitation of production about which they had heard so much recently, transcended party politics, and it was a matter associated intimately with the well-being of the nation. In recent conferences with which he had been associated he had not heard the term, restriction of production used. The term restriction of exports had been used, and it implied a relation to practically every commodity upon which the country had built up its national solvency. It had been said that if they restricted they would get higher prices for the commodity which they exported. But experience did not indicate that such was a fact. Last year butter exports were restricted for a certain period, and it was held that the price would be enhanced on the London market. In consequence of withholding certain supplies Queensland was harder hit than any of the other States of the Commonwealth at that time, because substantial charges in commission and storage had to be met. At that very time there was a fall on the London market, therefore there was little encouragement to believe that by holding back supplies they would obtain enhanced prices.

The time had gone when Australia could regard itself as an entity sufficient unto herself. Queensland was but one part of an economic whole, and the whole basis of the question was what was termed economic nationalism. That policy, however, could not, in his opinion, be sustained in the final analysis. Some countries were already feeling the burden of that policy and were preferring to go back to the old system of producing what they could economically and purchasing abroad what they could afford and what could not be produced economically at home. Theories of economics which were acceptable to one generation were not acceptable in another. If any truth had been brought home poignantly it was the interdependence of one nation upon another.

Queensland Citrus Scale Insects and their Control.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

(Continued from page 33.)

CONTROL OF INDIVIDUAL SPECIES OF SCALE INSECTS.

ALTHOUGH, as has been pointed out, scale insects, as a rule, occur in mixed populations, at times the control work can be confined to one species. Further, in order to understand fully the recommendations for combating complexities, it is necessary for growers to know how to control each species separately. For these reasons growers should study the following paragraphs dealing with each species.

Red Scale.

In so far as the coastal districts of the State are concerned, except in isolated places where the topography of the country exerts sufficient influence to cause materially higher temperature and perhaps lower rainfall than normally exists in coastal areas, red scale should occur as a serious pest only in abnormally dry times on trees other than lemons. If, therefore, in these districts a tree of any variety other than lemon be persistently heavily attacked by that scale, the true cause of the trouble is to be sought in some other factor affecting the health of the tree. Under some circumstances it is useless endeavouring to control the red scale satisfactorily until the health of the tree is improved. In most coastal areas, therefore, the first step in combating this scale is to examine the tree thoroughly for other trouble. Probably the two commonest injurious agents in this connection are the root bark channeller, *Pseudomydaus citriperda* Tryon and melanose, *Phomopsis citri*, and more often than anything else poor cultural conditions. In many cases all that is required to reduce the red scale infestation to insignificance is the use of fertilizer coupled with improved methods of cultivation. Active control measures, as described below, will, of course, accompany such operations to a certain extent, at least in the first instance.

In districts where the insect is a pest of otherwise healthy trees, fumigation should be practised where possible. Both the resin-soda-fish oil mixture and the oil sprays are also effective, and though not so efficient may be substituted for fumigation.

Seasonal life history studies show that there is no period of the year, except, perhaps, in winter, when reproduction is not in progress. Unfortunately, the winter is not a very good time to combat the pest. Red scale, though dead, may remain on the fruit for a considerable time unless appreciable expansion of the rind takes place, and thus, if the control be established too late, brushing of the fruit may still be necessary. Naturally, the dead scales are more easily removed than the living, but brushing is undesirable for other reasons. Further, early fruit, particularly mandarins and navels, are harvested very early in

the winter or even before the really cold weather begins, and thus the fruit on such trees would often be removed before control operations began. To the small grower with trees of early, mid-season, and late fruit, winter fumigation would cause much inconvenience, owing to its coinciding with harvesting and other operations, and would necessitate additional labour costs. Thus, though winter fumigation is effective and safe, it cannot be recommended for general use. The resin-soda-fish oil spray may be used in winter control work, but oil sprays should not be employed then.

By far the best period to establish control of red scale is between early March and the middle of April. If a good kill be obtained at this time the trees under normal circumstances will remain commercially free of the scale until January of the following year. During January the populations will perhaps be again built up considerably, and this sometimes leads orchardists into endeavouring to control the scale in that month. However, it is during the driest times that the red scale becomes most troublesome, and usually spraying cannot be carried out in January owing to the weather conditions. Fumigation may often be carried out at such times, but it must be remembered that the pest has still to pass through a period of prolific reproduction and therefore the establishment of a lasting control is not assured no matter how good the kill obtained. February is similar to January until the monsoonal rains commence, and from then until the rains cease pest control work cannot be undertaken. After the rains have finished a little time must be allowed to elapse to enable the recent growth to harden, otherwise this may be checked by the scalicide. As soon as conditions permit of the control work the colonies should be examined for parasites and the likelihood of any large hatch. Then, provided parasitation does not render artificial control unnecessary, the application should be timed to operate against the scales when there is a predominance of young, should such occur. The work should be allowed to wait as long as possible as the nearer it is done to the winter the more lasting the control will be. It must be remembered that six weeks will probably elapse between the time the scale is killed and when it will fall from the fruit, and also that if oil be used late this will interfere with the artificial colouring of early fruit.

This recommendation is based on the assumption that monsoonal rain will fall during February and March. If the dry season be protracted abnormally it may be that the scale position will become acute before the best period for control as outlined above arrives. Such a situation however is likely to occur only in the more inland parts. In many such districts irrigation is carried out, and a good deal can be done towards relieving the position by using plenty of water. It has been shown experimentally at Gayndah that by the use of water heavily-infested trees can be kept in fair condition for a considerable time longer than would otherwise be possible. If, therefore, orchardists find that the red scale is becoming a menace very much earlier than it is desirable to carry out control, steps must be taken to ensure the trees as good conditions as possible. It must be remembered that it is in these particularly dry seasons that red scale is most prolific, and therefore the

establishment of lasting control at such times by early work is considerably more unlikely. It is in such seasons as this that the larger horned citrus bug, *Biprorulus bibax* Breddin will most likely be in evidence, and in such circumstances reference should be made to the recommendations for the control of this complex of pests as given in connection with notes on the Rockhampton district.

In far-western areas it may at times be inadvisable to allow red scale to breed uninterruptedly for twelve months. This will be the case particularly when the winter is very mild or of but short duration. In such cases observation should be made on the trees during November, as otherwise the position may not be apparent until well into December, and control at such a time in these parts is only accomplished with great risk to the trees. If early summer control be established, it may happen that the trees remain fairly clean for several months with the result that the late summer-autumn period control is allowed to pass. This will mean that control will probably be again necessary in the early summer. In this way the main control period may become fixed for early summer. Control at this season is definitely less satisfactory than at the time recommended for general use, and, therefore, care should be taken to guard against this happening. It is necessary in such cases to examine the twigs and small branches and not be guided solely by the fruit infestation.

When two treatments in one year are necessary, only one should be an oil spray. Any other combination of scalicides will be more satisfactory than two oil sprayings. If oil and hydrocyanic acid are to be used it is generally found more satisfactory to use the fumigant for the first treatment.

The foregoing remarks apply essentially to older trees. Young trees may be attacked in any district. Trees purchased from a nursery and found to be heavily infested with red scale should not be accepted, as control of the scale is frequently obtained only at too great expense to the health of young trees. Any young tree, however, may carry a few red scale individuals, and these do not matter greatly and with most varieties other than lemons, and perhaps grapefruit, it will be found that these light infestations are thrown off naturally soon after the trees become established. Light oil sprayings may be used on young trees once these have become established, but even with these fumigation is preferable to all other treatments.

In general, red scale control operations in this State have previously been carried out mainly in November or thereabout. The recent investigations however have demonstrated that much better results are to be obtained by working during the late summer and autumn and that at such times the risk of injury to the trees is greatly lessened.

Circular Black Scale.

It will be seen from what has been recorded of the seasonal life history that young of circular black scale will ordinarily predominate in September, November, January, and March. Fumigation or spraying in September cannot be recommended owing to the possibility of injury to the tree, and January is normally too hot and too dry to permit of

control work being recommended for the districts in which this species is a pest. November and March, then, become the only periods in which control operations can be advised. Of the two March, or perhaps April, according to weather conditions, is preferred for the following reasons:— (1) In November the risk of injuring the tree, though not great, is still greater than in the late summer or autumn. (2) As has been mentioned in connection with the habits of the pest, the greatest objection to the scale is that it disfigures the fruit. The individuals do not migrate to the fruit to any extent until the late summer, and at this time a big proportion of the emerging young settle down on the fruit. Thus even if a good kill be obtained in November a period of great reproductivity has still to be passed through, and it is possible that before the fruit is harvested the fruit may carry an infestation. It is even possible that the whole tree may be again infested before the winter. It must be remembered that circular black is not a particularly injurious scale on the tree, so that the extra damage done by leaving the trees infested for somewhat longer than may be absolutely necessary will not matter greatly. (3) Breeding in the winter is at a standstill for all practical purposes and thus good control established in March or April ensures a low scale population for a longer period than at any other time of the year. (4) Circular black is commonly associated with red scale, and as the same scalicides are effective against both species it is advantageous to make one application suffice for both pests if possible. (5) A most important natural enemy of this scale commonly builds up a population during the summer months, and early in March it is commonly possible to assess the amount of scale which can be anticipated at harvesting time. This in itself if often of importance, for this enemy, *Catoblemna dubia* Butl., quite frequently removes heavy infestations of the pest and thus eliminates the necessity for artificial control.

It is recommended therefore that, though the late summer brood is rather more uneven than any other, control measures against circular black scale should be applied in March or thereabouts according to the time of emergence of the late summer brood. On the leaves circular black scale is not particularly difficult to kill, but the adult females on the fruit at the time of reproduction adhere very tightly to the rind and are thus more difficult to reach with sprays. It is therefore advisable to apply sprays at a time when the minimum possible number of females are reproducing. This means waiting until the fourth hatch is completed or as near that time as possible. If, as commonly happens, the red scale and circular black are associated, the time of application will usually be decided by the requirements for the dominant species but reproducing circular black on the fruit is less susceptible to sprays than is the red, and this point must be borne in mind.

As has been indicated fumigation, or spraying with oil or the resin-soda-fish oil mixture, may be employed against this species.

Mussel Scale.

Mussel scale is one of the most difficult citrus scale insects to control satisfactorily and orchardists should not neglect any appreciable infestations. It has been pointed out that lack of vigour is an important

factor predisposing the tree to heavy infestation, and the first recommendation therefore is to attend to the health of the plant. In this connection reference should be made to the remarks made in the discussion on the control of red scale. In the case of mussel scale, the bronze orange bug, *Rhœcocoris sulciventris* Stol., is a further important accessory to infestation and of most importance is the succession of mussel scale following injury by pink wax.

When good, vigorous trees are attacked the infestation is usually wholly confined to the fruit, and care must be taken to examine these in the early months of the year paying particular attention to the points of contact and the stem ends.

On account of the continuity of breeding no specific time can be given when young will probably predominate. At the same time, in the majority of orchards control operations can be timed to coincide with a large hatch of young and observations should always be made to ensure this if at all possible. As has been mentioned in connection with the life history, there is sometimes an approach to a pure brood during the latter part of February and, provided control operations are not delayed too long by rain, use may be made of such an occurrence. As the scales usually infest the fruit only after the middle of summer, it is towards the end of that season or in autumn that control generally is most desirable and in so far as healthy trees are concerned this is invariably the best time to combat the pest. On other trees any opportunity offered by suitable conditions of breeding and the state of the trees should be taken. In general, however, it will be found that late summer or autumn work will be attended by the best results in all cases.

Fumigation is most effective and should be employed where practicable. Spraying with straight oil cannot be recommended as certain to give commercial control against the heaviest infestations unless young predominate to the practical exclusion of other stages. Excellent results in all experimental work were obtained with the resin-soda-fish oil spray and this mixture can be recommended against even the heaviest infestations. Against light infestations, particularly when pink wax must be combated at the same time, the combination of soap and washing soda with oil may be used with success. This combination, though not so effective as the resin-soda-fish oil mixture, is considerably superior to straight oil.

White Louse.

This scale is very susceptible to hydrocyanic acid gas and control of the pest can be established at any time when fumigation is practicable. The white louse is also effectively combated with lime sulphur, and for reasons arising out of the use of these two scalicides at various times the control of the pest is generally best accomplished by the use of the spray. The best practice is to use lime sulphur in the late winter just before blossoming time at a strength of 1 to 12. By using the spray at this time a single application rids the tree of white louse before the new season growth appears and at the same time many other bark troubles are brought under control.

Whilst both lime sulphur and hydrocyanic acid gas are effective at almost any time against this scale insect the careful orchardist will always examine the colony to make sure that he is not operating just prior to an extensive egg hatch or that natural enemies, particularly the predatory moth *C. dubia*, are not present in large numbers—the latter a by no means rare occurrence late in the summer.

The resin-soda-fish oil mixture is also very effective against this pest.

Hemispherical Scale.

Due to a great extent to the activity of natural enemies it is seldom necessary to apply artificial control measures against the hemispherical scale. Before applying such measures it is always advisable to examine the colonies and learn to what extent parasites are present. It will generally be found that by the time the population of this scale is so large that the necessity for control measures is suggested, parasitism is so high that the infestation will soon be reduced to insignificance.

When exceptionally heavy infestations do occur these are never in evidence before January, and though November spraying may be carried out this is not likely to be of any practical value. January work cannot be recommended owing to the probability of adverse weather conditions. In general then the opportunities offered by the occurrence of young in March and April should be taken when artificial control is necessary. If spraying be delayed until the dormant season is very close, the resin-soda-fish oil mixture should be used, but if March work be possible either this mixture or oil may be used. The oil-lime sulphur combination should generally be more useful than straight oil, owing to the possible need for control of red spider or Maori at this time. Fumigation is effective, but hemispherical scale reaches its maximum and indeed only economic importance in those districts where fumigation cannot be satisfactorily used.

Olive Scale.

In no case has this insect been found in sufficient numbers in Queensland to cause the slightest concern, and it is most unlikely that artificial control of the species will be required. No experimental control work has been possible, and, in the circumstances, no definite recommendations can be made. It is probable that the recommendations made for hemispherical scale as above would give satisfactory results against olive scale.

Soft Brown Scale.

In no instance has this scale been seen on citrus in this State in appreciable numbers, and the small colonies which do occur are always confined to at most a few twigs on one or two trees in the orchard. Even in these the percentage parasitised is almost always very high and control by artificial means is thus not called for in any case. All that need be done in any case is to remove those twigs which carry colonies as soon as they are noticed. Fumigation and oil sprays have been found effective against this species in other countries.

Long Soft Scale.

When artificial control of this species is desired, either fumigation or oil spraying may be employed. Though the adults are rather soft bodied they appear to be rather more resistant to oil than might be expected and therefore control operations should be directed against the youngest stage possible. As the seasonal life history is not definitely known, the best time for applying control measures cannot be stated; but from experimental work it appears that late summer-autumn applications will give quite satisfactory results. As the scale is commonly accompanied by a growth of sooty mould control at this time is usually more desirable than at any other season.

Flat Scale.

With this species also artificial control measures have not so far been required and no experimental work has been done on this point. It is probable, however, that fumigation or oil spraying when the young are dominant would effectively control the insect.

Pulvinaria Scale.

Pulvinaria is not a difficult pest to control. Fumigation cannot be recommended in those districts in which the pest is of importance, but both oil and the resin-soda-fish oil mixture are effective. Of the two sprays the latter is to be preferred in general, on account of the fact that the control of the scale insect and the bronze orange bug can be effected concurrently by the use of this material and the two pests are commonly associated. The spray is effective against the scales many weeks old and generally the application can be made at the time most opportune for the control of the bug. Apart from this the mixture is more efficient against the scale insect than is the straight oil.

It is very fortunate that the females of Pulvinaria scale move from the twigs to the leaves to produce the large white ovisacs and thus become very conspicuous at this time. The most important point to be observed is that spraying must not be done too early. It is essential that the hatchings be complete and it will be noted that young do not emerge for upwards of a fortnight after the ovisac formation. It is the defunct ovisacs or their remains which must be looked for and not those full of eggs.

Where no other pest is to be considered control operations will be commenced as early as possible and in such cases, as the scale is often confined to but a portion of the tree and sometimes to only a limited number of trees, spot spraying may be profitably employed.

Pink Wax.

There is no other citrus scale insect in the State against which so much unsatisfactory work is done as pink wax. Failures are generally due to neglecting to give full consideration to the seasonal life history and habits of the pest.

From what has been recorded in earlier paragraphs it will be seen that there are two periods each year when young may be expected to occur either as the progeny of individuals already in the orchard or as

migrants from outside sources. As the outside sources are very extensive, control operations must be delayed until all the young which are going to arrive in the orchard have done so. The time of reproductivity in both orchards and natural forest will generally be found to practically coincide except where some factor such as irrigation enters. In most cases then the emergence need only be observed on orchard trees. However, as the outside breeding grounds are usually easily and quickly accessible it might always be advisable to carry out inspections of these sources. As has been recorded egg hatching is normally spread over a period of about one month. During this time the young grow to about the size of the head of an ordinary pin or a little larger. Thus by spraying when the typical young are about that size further infestation is unlikely to occur. The soap and washing soda spray is effective against young up to that size, but the efficiency quickly drops from that time onwards and therefore the application must not be too long delayed if good results are to be obtained. At times, owing probably to unusual weather conditions, the breeding is rather protracted, with the result that a big proportion of the first hatched young reach the size given above before reproduction is nearly finished. In such times as these the procedure will be dictated by the degree of infestation. If the number of females left to reproduce is rather small when the ordinary correct time of application is at hand, these may be ignored though, of course, this lowers the standard of control. If on the other hand the numbers are about equally divided it may be necessary to substitute the resin-soda-fish oil spray for the soap and washing soda and spray as late as possible without allowing too big a proportion of the young to grow to twice the size indicated above. The first-mentioned mixture is effective up to that time, but neither washing soda wash nor the soap and washing soda spray can be recommended against individuals appreciably larger than the head of a pin. The essential observations then are the size of the young together with the proportion of adult females which are reproducing. Each of these must be observed, otherwise confusing data will be obtained.

The times of appearance of the young vary considerably and the time of application of the scalicide may be in November or early December for the early summer generation and from late February to late April for the late summer brood.

In addition to the sprays given above hydrocyanic acid gas may be employed for the control of pink wax. When generated by the pot method the results are quite satisfactory and fumigation by this method can be recommended against the heaviest infestations of this pest. When calcium cyanide is employed the results are not so satisfactory and against very heavy infestations the sprays are superior. However, against ordinary or light colonies calcium cyanide fumigation is quite efficient.

White Wax.

It is very seldom necessary to apply artificial means of control against white wax in Queensland. The scale is usually confined to but a few branches on a few trees, and generally the entire colony can be removed and burned with the infested branch. With more general infestations however, spraying must be resorted to and when this is the case it is necessary to operate against the young as far as possible.

From the work done on the life history it appears that the period of control may occur any time between late January and the end of March, or perhaps even later. As with pink wax it is essential that the hatching be completed before the control measure be applied.

Soap and washing soda spray is effective only against the very young individuals and cannot be recommended against those which are at all well grown. The washing soda wash and the resin-soda-fish oil spray were both found satisfactory, and of the two the latter gave the best results in experimental work.

Cottony Cushion Scale and Mealy Bug.

Artificial control of either cottony cushion scale or the mealy bug is rarely called for in this State. Where large colonies of either occur it is generally due to the temporary absence of important natural enemies, particularly the ladybird *Cryptolæmus montrouzieri*. When the population of either species of coccid is observed to be increasing unduly a colony of the useful insect should be obtained. Generally in western areas the ladybird is common on prickly-pear where it finds another mealy bug to prey upon, whilst in coastal districts it is frequently to be found in large numbers on the bunya pine, *Auracaria bidwillii*, on which tree it is feeding on another species of coccid. Often, too, it may be absent from one orchard and be present in large numbers on a second only a few miles away. Growers then can most frequently supply the deficiency for themselves. The ladybirds should be given careful treatment, and if being transported in the larval or adult stage should be provided with a supply of mealy bugs or scale insects to avoid starvation. Fumigation or the resin-soda-fish oil may be employed if artificial control be desired.

SCALE INSECT CONTROL IN VARIOUS DISTRICTS WITH PARTICULAR REFERENCE TO COMPLEXES WITH OTHER PESTS AND DISEASES.

It is comparatively seldom that the problem of scale control is a matter concerning one species of scale only. In by far the greatest number of cases the grower requires to combat mixed populations of these parts. Furthermore, the occurrence of another pest or a disease may mean that it is either necessary or at least economical to vary the scale treatment from the one which would be used to combat the scale alone. Thus the value of simple recommendations for the control of individual species is rather limited. Table VI. shows, for the various districts, the complexes, which include scale insects. The manner in which the situations arising out of these mixed populations of pests can be best dealt with is outlined in later paragraphs. Variations from what has been given as the normal for each district may be found, and it is possible that the position on any one orchard will be more closely allied to what has been described for trees in other localities. It may therefore be advisable to peruse the notes on districts other than the one in which the orchard is situated. Apart from the more typical complications many others are to be found which cannot be included, but growers should be able to solve many of the problems for themselves after studying the manner in which parallel ones are attacked.

TABLE VI.

District.	Dominant Scale.	Pest or Disease likely to cause Modification of Treatment.		Other Scales of Importance.
		Pest.	Disease.	
Tamborine Mt. ..	Mussel	Red Scale Bronze Orange Bug	Melanose	
Redland Bay-Cleveland	Pink Wax	Mussel Scale Bronze Orange Bug Maori	Melanose	White Louse
	Red	Maori		
Brisbane to Landsborough	Pink Wax	Bronze Orange Bug Mussel Scale	Scab Melanose	White Louse
	Red	Larger Horned Citrus Bug	Scab Melanose	
Palmwoods, Woombye, Nambour	Pink Wax	Mussel Scale Pulvinaria Scale Bronze Orange Bug	Melanose Black Spot Scab Fly Speck	White Louse
	Red	Larger Horned Citrus Bug Pink Wax	Black Spot Scab Melanose	
Buderim Mt.	Pink Wax	Mussel Scale Bronze Orange Bug Red Scale	Melanose Black Spot	
Blackall Range ..	Mussel Pulvinaria	Bronze Orange Bug	Melanose Black Spot Fly Speck Scab	Pink Wax
Yandina to Gympie ..	Pink Wax	Mussel Scale Bronze Orange Bug	Melanose Scab	White Louse
	Red		Scab	
Burrum	Pink Wax	Mussel Scale Red Scale	Black Spot Emperor Brown Spot	White Louse
Rockhampton ..	Red	Circular Black Scale Mussel Scale Larger Horned Citrus Bug	Black Spot Scab	White Louse Long Soft Scale
	Pink Wax	Mussel Scale	Black Spot	
Yeppoon	Pink Wax	Mussel Scale Red Scale	Melanose	Long Soft Scale
Byfield..	Pink Wax	Mussel Scale	Melanose Fly Speck	
Gayndah	Red	Circular Black Scale Larger Horned Citrus Bug Pink Wax	Black Spot Scab	White Louse
Lockyer	Pink Wax	Mussel Scale	Melanose	White Louse
	Red	Circular Black Scale	Melanose	
Esk	Pink Wax	Circular Black Scale Red Scale	Melanose	White Louse
Roma and Far West..	Red	Larger Horned Citrus Bug Circular Black Scale		White Louse

Tamborine Mountain.

Mussel scale is the most commonly found species in the Tamborine district, whilst red scale and pink wax are also fairly abundant. A little hemispherical scale is also to be found at times. That mussel and red scales are of such importance in this district is due in part to the lack of vigour of many trees. As has been pointed out lack of vigour is an

important predisposing factor with each of these species. The reasons for the condition of the trees are purely cultural for the most part and cannot be discussed here. It must be pointed out, however, that very few growers appear to realise fully the ill-effects of constant winds on citrus trees. In so far as the scale position is concerned, there are two main effects of these winds. In the first place, natural enemies, particularly entomogenous fungi such as *Spaerostilbe coccophila*, are much more active in protected places than where the trees are exposed to constant dessicating winds and this is undoubtedly a contributing factor in many instances. However, the greatest cause of heavy scale population in this district is to be looked for mainly in the action of the winds on the trees themselves, and the provision of windbreaks will certainly improve the position with respect to the dominant scale species quite apart from the consequent increase in natural control. Consideration should be given to the provision of windbreaks, and, above all, it is essential that existing natural windbreaks should be preserved as far as possible. Melanose and pests which impair the vigour of the trees also contribute in some orchards to the unsatisfactory scale position. If the health of the trees be given proper attention it will be found that the only artificial control measure which need be applied against the scale insects at Tamborine Mountain is the use of the resin-soda-fish oil spray as recommended for combating the bronze orange bug.

Redland Bay-Cleveland District.

In the Redland Bay-Cleveland district there are two distinct types of scale infestation to be found. For the most part only one type is present on each orchard, but in some cases both types may be present on different trees in the one orchard and on occasions the types are merged. The first type, which is generally the most severe but which is the less common, has red scale as the dominant species. Mussel scale may be present and the trees commonly carry a good deal of white louse. This association is brought about to a large degree by the subnormal vigour of the trees and is consequently mostly in evidence on orchards on weaker soils or in exposed positions. Exposure to strong winds is a definite factor in the health of many of the trees in this district, and for the most part elimination or considerable reduction in the influence of these by the provision of windbreaks will accomplish much towards the control of these scale pests. In other parts cultural conditions need attention, and for the most part in these cases it appears that nitrogen deficiency of the soils should be made good as a first step towards the commercial control of this type of scale insect association. Owing to the breeding grounds provided by trees such as those mentioned above, these scale insects may spread to nearby healthy trees to a small extent, and it is on such trees that the two types of infestation may merge as mentioned above. Where possible it is obviously of first importance to reduce the breeding grounds and to correct predisposing factors, and artificial control must be considered of secondary importance for the most part where this type of scale population predominates. Where conditions are such that commercial control is possible by purely artificial methods, oil or the oil-soap-washing soda combination will give beneficial results if applied in accordance with the requirements of the dominant species. If Maori be abundant during the control period the oil-lime sulphur combination may be used if the temperatures are not excessive. The resin-soda-fish oil mixture will very often give the most lasting beneficial results, particularly where the mussel scale is heavy.

The second type of infestation is one in which pink wax is predominant, at least in the first place, and in which mussel scale is an important factor. White louse may also occur on these trees but is generally less evident than with trees affected by the first-mentioned scale complex. Pulvinaria scale is commonly found but usually in small infestations on any one tree. The trees carrying this pink wax mussel scale complex are, for the most part, the more vigorous ones and consequently the bronze orange bug may also be present. Melanose may be found on these trees, but usually it gives concern only in so far as it causes blemishes on the fruit. With this type of association the mussel scale is generally of importance only as a pest of the fruit, but if the trees be neglected for any length of time this scale may become more and more important until finally pink wax becomes of little moment and the twig and branch infestation by the mussel scale assumes major significance.

In so far as this type of association is concerned the use of soap and washing soda in the early summer as required for the control of pink wax, followed in the late summer or autumn by a thorough spraying with the resin-soda-fish oil mixture is to be recommended. If the pink wax be very prevalent the second application should be timed as required for the control of that pest, but if the bronze orange bug be of more importance the resin-soda-fish oil spraying should be applied as recommended for the control of that species, and this in general will suffice for the control of both scales and bug. In abnormal cases it may be necessary to establish special control of the pink wax earlier and then the soap and washing soda spray should be applied. This, however, will rarely be required. If the melanose is to be combated it may be necessary to use the combination of Burgundy-soap and washing soda in place of straight soap and washing soda in the early summer. If the bronze orange bug is not to be considered at all oil-soap-washing soda may be substituted for the resin-soda-fish oil spray, but this is not to be generally advised.

Brisbane to Landsborough.

From Brisbane to Landsborough orchards are for the most part small isolated areas, and consequently conditions change greatly from orchard to orchard. Much of what has been written concerning the Redland Bay-Cleveland district applies to this area also. There are, however, a few places in which, owing to purely local conditions, red scale becomes a pest of fairly vigorous trees. A proportion of the orchards in this district are situated on unsuitable soil, however, and this is more often a factor in red scale incidence than is climate. Bronze orange bug occurs throughout the area, but as handpicking suffices for the control of this pest in most cases in the area under consideration, this does not often affect the control measures to be adopted against the scale insects. For the greater portion of the area the measures recommended for the control of individual species may be adopted, and as conditions often permit of the use of hydrocyanic acid gas fumigation is valuable. Where fumigation is not practicable spraying with oil or, if Maori be abundant, the oil-lime sulphur combination may be used except where pink wax predominates. Against pink wax either the soap and washing soda spray or resin-soda-fish oil may be employed in accordance with the requirements for this species. Pulvinaria and white wax are also to be found in places, generally associated with pink wax, and in such cases the resin-soda-fish oil must be used in the late summer

and the use of soap and washing soda mixture confined to the early summer for the control of the pink wax. Scab disease is common on lemons and mandarins in this area, and if this disease is to be combated the Burgundy-soap and washing soda combination may then be substituted for the early summer application of soap and washing soda, and the resin-soda-fish oil spray should then certainly be used in the late summer-autumn period.

Palmwoods—Woombye—Nambour.

On healthy, free-growing trees, other than lemons and to a lesser extent grapefruit, in these districts, pink wax is invariably the outstanding scale pest. Mussel scale is also commonly found, but if the orchard be well tended this species is usually confined to the fruit in pest proportions. Where concurrent control of these pests is desired the resin-soda-fish oil mixture should be employed. The time of application will ordinarily be dictated by the requirements for the control of pink wax. It will generally be necessary to use soap and washing soda in the early summer for the control of that brood of the pink wax. The presence of scab, particulauly on Beauty of Glen Retreat mandarin trees, may necessitate the use of the Burgundy-soap and washing soda combination in the early summer, but this is unlikely, as usually the time of application of the fungicide will not coincide with that for the scalicide. Melanose and black spot are also prevalent in the district, and if for any reason the continued used of Bordeaux or Burgundy is required the resin-soda-fish oil spray should be used for the control of all scale species. The time of application of this spray will usually be in conformity with the requirements for the dominant scale species, but at times the bronze orange bug may be prevalent and this may necessitate some change. Except where pink wax is the important scale pest this will not matter greatly, for the spray will give quite good results against all other scale pests if applied at the time required for the control of the bug. If the pink wax be very heavy and the period of control far removed from the time of application for the bug, it may be necessary to use soap and washing soda in addition to the resin spray, but this is a rather unlikely happening.

Where red scale is persistently present in large numbers on orange and mandarin trees in this district, the health of the trees needs attention and this should be the first step in the control of the pest. Artificial control may generally be accomplished by the use of straight oil, or if the Maori be prevalent late in the year oil-lime sulphur combinations may be used with good effect. White louse should be kept under control in this district, and the normal method of control for this pest should be regularly employed.

Blackall Range.

The Blackall Range district is somewhat akin to the Tamborine Mountain area, but a greater proportion of the orchards on the Range are protected from the strongest winds, and though winds are constant they are of less importance here than in the Tamborine area. For the most part well-tended orchards on the Range are not troubled to any extent by scale pests, and in general it will be found that if the resin-soda-fish oil spray be applied as recommended against the bronze orange bug nothing further need be done towards the control of the scales. As the spray forms no harmful combination with residue left after Bordeaux

spraying, the occurrence of black spot and melanose will not ordinarily have any bearing on the control of scale insects. Pulvinaria and mussel are the dominant scale species, and though the former is at times the more numerous the latter must be considered the more dangerous. In isolated parts pink wax sometimes occurs in pest proportions and thus may call for special attention. In such cases the recommendations made for the control of pink wax as an individual species hold.

Nambour to Gympie.

Generally speaking pink wax is the most important species of citrus scale insect in the smaller citrus-growing areas between Nambour and Gympie and in the Mary River Valley. Red scale, however, is rather abundant in parts, and if the trees be situated in humid parts mussel scale quickly takes advantage of lax cultural operations. For the most part the recommendations made for the Palmwoods-Woombye-Nambour area apply to this district, but in the latter fumigation is practicable in many places and should be employed when and where effective.

Burrum.

Pink wax is the outstanding scale pest of the Burrum district. Mussel scale is also very prevalent and commonly follows up the injury done by the wax species. When these two pests alone are to be considered, fumigation in the early summer followed by oil-soap-washing soda combination or the resin-soda-fish oil spray in the late summer or autumn months is the most useful treatment. If the mussel scale is not to be considered the spraying may be made with soap and washing soda straight, but if the mussel scale predominate it is better to use the resin-soda-fish oil. In this district the late summer spray application is very commonly done much too early, with consequent poor results. The presence of brown spot disease on the Emperor of Canton mandarins may complicate the position by rendering fumigation impossible. In this case the Burgundy-soap and washing soda, or soap and washing soda spray may be substituted for the fumigation and then the late season application should always be one of the resin-soda-fish oil mixture. Straight oil sprays are often used in this district, but these sprays have little value here, and growers who use them extensively would, for the most part, be well advised to discontinue the practice. White louse is prevalent in the Burrum district, and lime sulphur should be used annually at the time recommended for the control of that scale.

Rockhampton.

Fumigation should generally be employed in the Rockhampton district, particularly in those parts where red scale is the dominant scale pest. The occurrence of the larger horned citrus bug may necessitate the use of fumigation a good deal earlier than it is recommended for use against the red scale. The subsequent treatment for red scale and its common associate in these parts—circular black scale—will depend to a very large extent on the seasonal conditions. If the weather remain hot and dry it is probably that the red scale will breed so rapidly and successfully that further combative measures may be necessary. It is in such times as this that the bug is most in evidence and that a second treatment is called for against that pest. If this be so there will be no need for any further special treatment for the scale insects. If the weather change early in the year, ordinarily the

red scale and the bug will both be quite effectively controlled by the one fumigation, but in such times in this district mussel scale may quickly assert itself. If this happen use should be made of the resin-soda-fish oil spray as soon as conditions permit, or if the mussel scale infestation be lighter oil-soap-washing soda may be used. Because an early fumigation for the bug has apparently given fairly satisfactory results orchardists cannot assume that no further treatment is necessary, and it is still always advisable to examine the trees carefully during March and ascertain the exact position with respect to red scale. If this be not done and the red scale position taken for granted, it may mean that a control will be found necessary early in the following summer, and this is to be avoided for reasons given in earlier paragraphs in connection with the control of red scale as an individual species.

In cases when the March examination suggests that the early (January) fumigation has not reduced the infestations to a point which ensures low populations during the following spring and early summer, a further treatment should be given before the winter. Fumigation may be again employed. More commonly spraying will be preferred and in this event oil, oil-soap-washing soda, or resin-soda-fish oil may be used according to whether there is any complication. If red scale alone be of importance straight oil will be quite satisfactory.

On occasions the occurrence of a fungal disease, which requires the use of Bordeaux mixture for its control may prejudice the use of fumigation or oil spraying. It is important that before Bordeaux is used the trees should be as free of scale as possible. To ensure this it may be necessary to use fumigation in the winter prior to the first application of the fungicide. The trees from then on must be given as good treatment as possible, and in the late summer or autumn months the resin-soda-fish oil spray must be used for the control of the scales. It is important that the trees be kept well watered and not allowed to suffer any more than can be avoided from dry weather conditions. Owing to the probability of high temperatures prevailing even as late as the end of March, the use of the resin-soda-fish oil spray or perhaps oil sprays will possibly be rather later than would otherwise be the case and this point must be borne in mind.

White louse must be kept under control in this district, and even if fumigation be practised it is advisable to use lime sulphur in the late winter as recommended for the control of this pest. The occurence of scab may affect the situation a little, particularly in the case of lemons. Generally, if the infestation be light, lime sulphur is substituted for the first application of Bordeaux, but this almost certainly leads to a loss in fungicidal effect, and cannot be recommended against heavy scab infestation. If the amount of scab be large it is better to confine the lime sulphur application to the trunk and main limbs, and use the Bordeaux on the outside only for the first spraying. The second application of Bordeaux will not be influenced by the previous use of lime sulphur.

In isolated parts of the Rockhampton district pink wax and the long soft scale are common almost to the exclusion of red. In general these species may be combated in the manner recommended for the normal control of individual species. Mussel scale may be associated with these others, and this may necessitate the use of the resin-soda-fish oil spray if fumigation is not to be employed.

Yeppoon.

Pink wax and mussel scale form the most important pest combination in the Yeppoon district, and generally there is no other pest which will interfere with the adoption of the normal measures for combating those scales—i.e., the use of soap and washing soda at the time of appearance of the first brood of the pink wax followed by the use of oil-soap-washing soda or the resin-soda-fish oil spray in the late summer. The occurrence of the black passion bug, *Leptoglossus bidentatus* Montr., as an occasional migrant in large numbers to citrus may mean that it is much better to use the resin-soda-fish oil spray than the oil-soap-washing soda combination. Melanose is rather common in this district, and this may mean that the variation recommended for the Palmwoods-Woombye-Nambour district may be of value.

Byfield.

Pink wax is usually almost the sole scale insect of any moment in the Byfield area, and in normal years it reaches greater intensity in this part than in any other commercial citrus district in the State. Mussel scale may be associated with the pink wax, but the seedling trees, which are so commonly grown in the Byfield district, appear to harbour less mussel scale than might be anticipated. The normal method of control as recommended for the control of pink wax alone will usually be applicable in Byfield. The fly speck fungus, *Leptothyrium* sp., is at times prevalent in the district, and for this reason the use of resin-soda-fish oil spray may be more desirable than the soap and washing soda spray.

Gayndah.

The Gayndah district is very similar to the Rockhampton one, except that mussel scale is much more uncommon in the former. The climates are similar, and the pests, other than scales and diseases, are common to both. Reference should therefore be made to the recommendations for the Rockhampton district.

Lockyer.

On the whole pink wax is the most important scale insect of citrus in this district. Mussel scale and circular black are also very common in places, and in dry times red scale quickly becomes abundant. Fumigation is usually practicable in this district, and its use is to be recommended in general. Pink wax will usually be associated with mussel scale, so that if fumigation is not to be employed the recommendations for the control of this combination as made for the Palmwoods-Woombye-Nambour district should be adopted. Red scale and circular black may be attacked with oil sprays or, if Maori be prevalent, the combination of oil and lime sulphur may be employed if conditions permit.

Black spot and melanose are rather common in parts, and if this be the case reference should be made to the recommendations made for the Burrum district.

Esk.

In this district fumigation is to be recommended. The general position here is similar to the Lockyer area, though red scale is more common in the former district. In general pink wax will be found in

pure colonies, and the red and circular black mixed on other trees. In such cases the recommendations made for the control of individual species will apply. When complications occur reference should be made to what has been given for the Nambour-Palmwoods-Woombye district or the information given under Rockhampton may be of value.

Roma and Far Western Districts.

In inland districts, such as Roma, red scale is the outstanding scale pest in normal times, and as conditions permit of fumigation this should be practised. A special reference to the control of red scale in such districts is included in the discussion on the control of that species as an individual pest. The larger horned citrus bug may cause modification of the procedure in the same way as given in connection with the Rockhampton district. For general purposes reference should be made to what has been written on Rockhampton.

NOTES ON EXPERIMENTAL WORK.

What follows is a brief outline of the methods used in the course of the investigations in procuring and using data.

Life History Breeding Work.

The data concerning the life history of each species were obtained in the following manner, except where has been mentioned otherwise in the text:—Adult females about to reproduce young were kept in the laboratory. In the first place, as the young emerged these were removed each day until sufficient young emerged on one day to commence a large enough colony. When these large batches were present they were transferred to a leaf either by gentle shaking or with the aid of a single fine hair. In the cases of pink wax, hemispherical, mussel, cottony cushion and white louse, the young transferred were definitely not more than nineteen hours old—i.e., 5 p.m. to 9 a.m.—but in the case of white wax, red scale, and circular black scale, owing to the habit of the young of remaining beneath the female for some time after emergence and the great difficulty of obtaining them without injury before they crawl out of their own accord, the young were collected as they emerged naturally from under the mother scale. In these cases the times were taken from the emergence from beneath the mother to that time in the following generation. As soon as the young were placed on the leaf this was fixed on a small tree known to be free of scale. The leaf was so placed that the young had to crawl from it on to the tree, and thus the number of injured young in the colony was greatly reduced. After infestation in this manner the experimental tree was enclosed in a cage of finewire gauze, and thus shielded until such time as chance arrivals from outside sources could be recognised. After that time the gauze was removed and the tree left entirely unprotected, and thus under quite natural conditions. In each case the tree used was of a variety commonly found to harbour the species in the orchard. Thus pink wax was bred on Emperor of Canton, red scale on Late Valencia and lemon (fruit hung on tree), hemispherical scale on Beauty of Glen Retreat and Late Valencia, Pulvinaria on seedling orange, white wax on seedling orange and Scarlet mandarin, white louse on Glen Retreat and seedling orange, circular black on seedling orange and lemon, mussel scale on seedling

orange and Late Valencia, Cottony Cushion on Late Valencia and seedling orange, and soft brown on Scarlet mandarin and Joppa. The number of individuals in each colony was between 200 and 1,000. Observations were carried out with such frequency as was suggested as necessary by the development. Thus, as maturity approached, observations were made daily. In addition to inspection of the whole colony on the plant as maturity approached, a number of individuals were removed each day and examined in the laboratory. The number thus examined varied from five to ten daily up to the time that eggs or, in the case of viviporous species, young were becoming numerous. For this work, as far as possible, the most forward individuals were selected. The females were gently lifted slightly in the first place to ascertain whether or not reproduction was under way. If reproduction was found to be in progress the examined females were removed. The periods given as the developmental ones are the periods occupied by the greatest number of individuals and are not averages of the times taken by all the individuals. The second and subsequent generations were started as follows:—In each case a new tree was used. With pink wax, white wax, circular black, hemispherical, and Pulvinaria scales, old females beneath which were crawling young were placed on the new tree at the time of greatest reproductivity for the previous colony. These females were allowed to remain on the tree for twenty-four hours, and then were removed. In the cases of red, mussel, and white louse, the number of young produced by any one female in twenty-four hours was too small to permit of this method being used. With these species the procedure described for the establishment of the original colony was repeated at each generation, the females of the previous experimental lot being used to provide the young.

Whilst these experimental colonies were under observation specimens from each of the following districts were examined at short intervals:—Howard, Burrum, Montville, Mapleton, Palmwoods, Gatton, and Gayndah. These specimens were selected by various orchardists as being typical of the scales in their orchards at the time of forwarding. The interval at which these specimens were forwarded varied with the state of development of the scales from two months during the winter to one month in the summer and ten days at the time of reproduction. The data obtained from these specimens were tabulated against that from the experimental colonies at Nambour. Visits were made to each of the centres mentioned, and others at irregular intervals throughout the investigation, and in this way a check was kept on all specimens.

Tests of Scalicides.

In testing the scalicidal value of the various materials the following methods were employed:—In the cases of slow breeding species, such as Pulvinaria and white wax, direct counts were made, the only point being that the insects counted were confined to parts that would be readily reached by the spray. In the case of pink wax, migration is such an important factor that the procedure must be varied a little. In this case, from every tree twenty to thirty leaves were taken and the average number of living young per leaf computed. As soon as possible after this the application was made, and as soon as the living and dead

scales were easily differentiated a second count was made. The following figures from one experiment will show the results obtained in this way:—

First count	26th April, 1934
Sprayed	29th April, 1934
Second count	12th May, 1934

Young scale only counted. Practically 100 per cent. of old scales dead in all cases.

Sprayed trees—	
Average living young at first count	10·5
Average living young at second count	·26
Unsprayed trees—	
Average living young at first count	12·0
Average living young at second count	14·0

Percentage improvement due to spray, 97·99 per cent.

The percentage improvement is calculated in the following way: — The average number of young on the unsprayed trees had increased from 12·0 to 14·0; so that, assuming the same conditions on the sprayed trees, apart from the effects of the spray, the 10·5 average on these would have become 12·25. Thus the trees have improved from 12·25 to ·26, or 97·99 per cent.

With red, Circular black, and mussel scales counts were made, and the averages computed on all trees immediately before the application and six weeks later. The experiment quoted in the section "The Importance of Time of Application" gives the results of this method. In that experiment it will be seen that the scale on the unsprayed trees increased from 24·45 to 416·6, whilst on the sprayed trees the average decreased from 31·5 to 16·8. Assuming the same conditions for all trees except in so far as the application of the scalicide is concerned, it will be seen that in the interval the 31·5 scales of the sprayed trees, if unmolested, would have increased to 536·7, whereas actually the average was only 16·8, or but 3·1 per cent. of this total. Therefore it is assumed that the spray had had a lethal value of 96·9 per cent.

The six weeks' interval was chosen, as it was found that counting within a shorter interval than that did not always give quite reliable data, due, no doubt, to the comparatively small number of scales which can be handled in a reasonable length of time. By waiting for six weeks the position is much more clear, for in that interval many of the dead scales have fallen, and those which remain on the tree are quite easily distinguished from the living. This method is, of course, only possible for species with which migration is not a factor. The fact that reproduction is constant and rapid is an advantage, in that the increase tends to magnify the differences between sprayed and unsprayed trees without altering their absolute relations.

In laying out the experimental plots, trees of one variety in as compact a block as possible were used. Thorough examination of the trees was made in the first place to ensure that scale infestations and general conditions were comparable. In determining which trees should be used as checks and which given particular treatments, a method of randomisation involving the use of two series of numbered pellets was

used. In making all counts, only parts of the tree easily accessible were taken into consideration. These tests were, for the most part, concerned only in determining the lethal value of the materials.

In testing the value of actual treatments, it was assumed from the work in other countries that hydrocyanic acid gas would probably give satisfactory commercial control lasting not less than twelve months. The problem then became essentially one of discovering just when the fumigant should be applied. The experiments then were ones of trial and error, using the facts concerning the life history and habits as these became known. In this way each part of the investigation helped to elucidate data for the other. It has not been possible to test every brand of spray over a full twelve months, but it is reasonable to assume that if hydrocyanic acid gas gives a kill of 99 per cent. and a spray of 96 per cent. "kill," the controls will be, roughly, in the proportion of 99:96 provided both are applied at the same time.

SUMMARY OF INVESTIGATIONAL WORK.

1. Fourteen species of scale insects are recorded as attacking citrus in Queensland. Two of these species are recorded for the first time as pests of citrus in this State. *Pulvinaria cellulosa* Green appears to be a new record for the State, and *Paralecanium expansum* Green, though previously recorded from *Ficus macrophylla* Desf., has not previously been found on citrus. The evidence obtained throws doubt on the occurrence of *Lepidosaphes gloveri* as a pest of citrus in Queensland.

2. The economic status of the group and of each species and the factors tending to magnify or minimise the importance of each species are discussed.

3. The seasonal life history and habits of each of the important species have been studied and recorded.

4. Questions dealing with the natural enemies have been investigated, and notes are given on the more important species of these. With only one species—*Ceroplastes rubens*—it is considered that the introduction of further natural enemies is likely to be attended by worthwhile results.

5. The control of individual species has been the subject of experimental work, and the conclusions arrived at are given.

6. Special attention has been given to ways of combating the common complexities of pest and diseases which include scale insects.

7. The resin-soda-fish oil spray has been the subject of much work, and it is concluded that though the spray is somewhat cumbersome to prepare it is a most valuable scalicide, particularly in those cases where copper containing fungicides must be used. Apart from its use under these circumstances, the spray has proved itself very little inferior to hydrocyanic acid gas as a scalicide.

8. Special attention has been paid to oil sprays. It is concluded that with the introduction of the highly refined white oils much of the objection to the use of oil on citrus is overcome. The discontinuance of the general use of red oil is advocated. It was found that oil sprays are used very often quite wrongly, and growers are advised to use this class of spray only when they are certain that the desired result will be obtained.

9. Questions concerning the mixing of two sprays and following of one spray by a second have been investigated, and for the most part the results given were obtained in experiments on commercial orchards.

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SEAT FOR THE HARROW.

A harrow having no seat can be provided with one, as shown in the drawing. The seat support is made of 1-inch by 6-inch and 2-inch by 6-inch wood, securely nailed together as indicated in the lower right-hand detail. Two holes are drilled through the lower end of the 2-inch by 6-inch uprights to accommodate the axle of an old wheel, which can be taken from some discarded implement. Parts of an old cultivator, with collars and a brace added as shown, is used as an axle for the wheel.

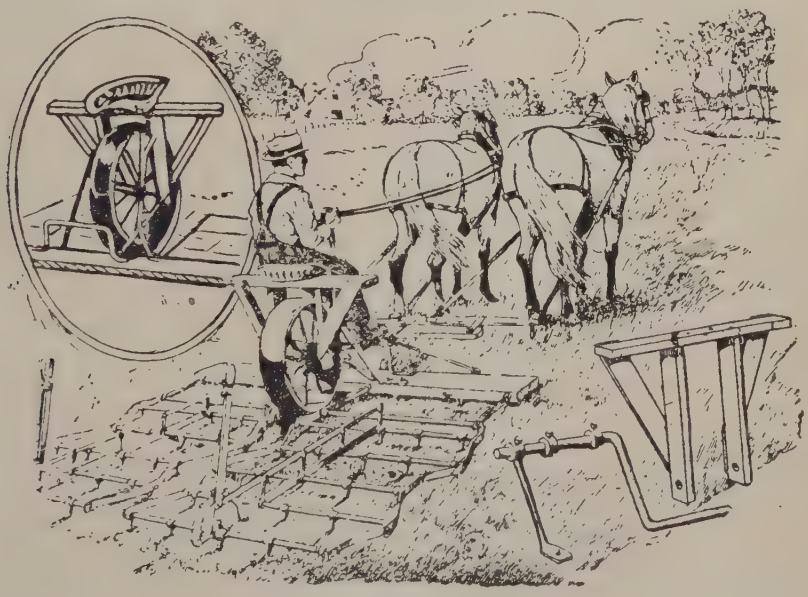

Plate 74.

It is securely fastened to a 2-inch by 6-inch "draw plank," which is attached to the front of the cultivator. Additional flat-iron braces are provided to hold the seat support rigidly to the draw blank, and a foot-rest, made of ½-inch iron rod and bent to the shape indicated, is also attached to the draw plank. An iron seat from a discarded implement is fastened to the support in the most convenient position for the driver. In use, the wheel rests on the ground, and when the horses are walking, the draw plank is raised from 2 inches to 4 inches, while at the standstill it rests on the ground.

Parasites of the Pig.

By F. H. S. ROBERTS, M.Sc., Entomologist, Animal Health Station, Yeerongpilly.

EXTERNAL PARASITES.

THE principal external parasites of the pig include lice and mites, the latter being responsible for mange conditions.

Lice (*Hæmatopinus suis*).

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PLATE 75.—PIG LOUSE (*Hæmatopinus suis*). Ten times natural size.

Pig lice, *Hæmatopinus suis*, are found everywhere in Queensland where pigs are reared. The species is one of the largest lice known and may measure up to one-quarter of an inch in length. The male is smaller than the female and may be readily distinguished by the presence of a black streak on the underside of the abdomen. The mouthparts consist of a proboscis or beak with which the louse is able to pierce the skin and suck up blood. This continual puncturing of the skin causes considerable irritation, which may in time so lower the vitality of the animal as to produce an unthrifty condition and render it more susceptible to attack by other parasites and diseases.

Life History.

Eggs deposited by the females are glued to the bristles of the pig and hatch in from 12 to 20 days, usually in about 14 days. The young louse is very similar in appearance to the adult, differing mainly in size. After hatching, the young lice immediately commence feeding, and after 10 to 12 days become mature. Lice may live as long as 35 days and during her lifetime the female lays about 90 eggs.

Mites.

Two species of mites infest the pig, each of which is responsible for a condition of mange. One species causes Sarcoptic mange, the other, Demodectic mange.

Sarcoptic Mange (*Sarcoptes scabiei suis*).

Sarcoptic mange or common mange is caused by the mite *Sarcoptes scabiei suis*. This mite is very small, at most only one-fiftieth of an inch long, and whitish in colour. The body is rounded with four pairs

of short thick legs, and provided with a number of short backwardly projecting spines on its upper surface. The parasites live in galleries under the skin in which the female lays her eggs. These eggs hatch in 3 to 10 days and after another 10 or 12 days, the young mite becomes sexually mature. There is thus a new generation produced at least every 13 days.

Plate 76.—Sarcoptic Mange Mite.
Female. Magnified 100 times.
[*From Farmers' Bulletin* 1085, *United States Department Agriculture.*

Symptoms of Sarcoptic Mange.

The burrowing of the mites through the skin causes the skin to become inflamed and swollen. At first, these inflamed areas are very minute, but in time become very conspicuous and as the mites increase the lesions gradually coalesce. The irritation causes the animal to rub itself against any convenient object, the areas become raw and bleeding and large scabs are formed. The movements of the pig causes a continual breaking of the scabs and blood and serum ooze out from the cracks. The bristles on the affected area fall out and eventually only a few or none remain. Later the skin becomes hard, thickened, and thrown into folds. In severe cases the animals affected become weak and emaciated and unless treated may die.

In the early stages of the disease the lesions usually occur on the head, around the eyes, ears, and nose, and from here the disease spreads along the neck and shoulders until the entire body may be affected.

Demodectic Mange (*Demodex phylloides*).

This type of mange is caused by a very minute worm-like mite, *Demodex phylloides*, and is much less common than Sarcoptic mange. The mites of Demodectic mange are microscopic in size, measuring up to one one-hundredth of an inch. They spend their entire life in the hair follicle or sweat glands, and when in numbers cause well-marked lesions. These lesions usually appear first on the snout or around the eyelids and from there spread slowly over the throat, breast, abdomen, and other parts of the body where the skin is soft and thin. The effected skin becomes reddish and scurfy with numerous small hard nodules. These nodules eventually break and discharge a creamy pus, and many of them may run together to form suppurating cavities.

Diagnosis of Parasitic Mange.

The pig at times may be subject to many various skin diseases, and for an accurate diagnosis of Sarcoptic or Demodectic mange it is best to submit samples of scrapings from the affected skin for examination. The scrapings, to include the mites, should be taken from the more recent lesions, and should be made deep enough to cause the appearance of blood. The scrapings should then be placed in a tightly-corked tube or bottle and forwarded for examination.

Control of Lice and Mange.

For the control of lice and mange, crude oil or fuel oil will be found satisfactory. The oil may be easily applied by hand, and owing to its adhesive and spreading qualities only comparatively small quantities are required. In the case of lice, a second application is desirable after fourteen days. For severe cases of Sarcoptic mange frequent dressings are necessary; but tests have shown that a complete cure may be expected provided careful and persistent treatment is given. Before being treated with the oil, the affected animal should be thoroughly scrubbed with warm soapy water.

No specific cure is known for Demodectic mange, but frequent applications of crude petroleum check the disease. Animals not responding to treatment should be killed. Animals oiled with crude oil should be kept in the shade as much as possible until the oil has dried, as contact with the sun is likely to cause blistering.

Hog oilers and medicated wallows and dips are frequently recommended as methods of controlling lice and mange. Hog oilers consist of posts wrapped round with oiled ropes or sacking and placed at some convenient spot, the idea being that the pigs will rub themselves against the post so that a small quantity of oil is deposited on or near the area of skin being rubbed. These devices tend to lessen the spread of lice and mange, but, as the pig will rub against any convenient object, are not to be depended upon to effect eradication or prevent the losses caused by heavy infestations.

By taking advantage of the pig's natural tendency to wallow in water, especially during warm weather, the use of crude oil on the surface of the water will be found satisfactory for the control of external parasites. The wallows should be constructed of concrete, and the water, with its film of oil, should be of just sufficient depth so that the nostrils can be easily kept above the surface of the liquid. For pigs of 40 to 80 lb. weight the depth should not exceed 3 inches, 6 inches being the maximum for the largest pigs. If the depth is too great the animal is afraid to lie down. The wallow should be roofed over to prevent the water becoming too hot. The wallow, moreover, should not be kept oiled continuously, but for short periods every ten days, until the desired results are obtained.

Dipping is one of the most effective treatments for lice and mange. The dip consists of a concrete bath 40 to 48 inches deep, with a total length of at least 7 yards, constructed on the same general principles as a cattle dip. The oil dips are usually considered the most economical and most dependable dips, and of the oils available, crude petroleum is recommended. The dip is filled with water, on which the oil is poured to a depth of 4 or 5 inches.

Attention should also be paid to sanitation. As lice will not live for more than three days off the pig, it is not considered that sties which have housed infested pigs would be a source of danger under sanitary

conditions. It is always better, however, that such sties should be given a thorough disinfection and cleaning before clean pigs are placed in them.

Mange is highly contagious, and pigs showing symptoms of mange should be immediately isolated. Visible lesions of Sarcoptic mange may develop in fourteen to fifteen days; so animals in contact with affected pigs should be isolated for this period. All litter and manure should be cleaned up and burnt and the sties given a thorough disinfection. It should be remembered that Sarcoptic mange is transferable to man; so it is advisable, after handling affected pigs, to bathe and have a complete change of clothing.

INTERNAL PARASITES.

No less than seventeen internal parasites or worms have been recorded from the pig in Queensland, but fortunately many occur only in small numbers and are not of any economic importance.

Flukes and Tapeworms.

In Queensland, flukes are unknown in the pig, except for rare instances when the liver fluke of sheep, *Fasciola hepatica*, has been observed in the liver.

The pig does not harbour any species of adult tapeworm but may act as a host for two larval tapeworms which reach maturity in the dog. These larval forms are known as *Cysticercus tenuicollis* and *Echinococcus granulosus*. Only the latter is of importance, as it is the cause of hydatids, which is a serious disease in man.

In the pig, the larval hydatid usually occurs in the liver and lungs, and consists of a bladder of fluid containing numerous minute white specks. Infestation may be prevented by seeing that the pigs are not given access to the fæces of dogs, by thoroughly boiling all offal before feeding it to dogs, and also by regular treatment of all dogs with an efficient vermifuge to remove the adult worm.

Roundworms (*Stomach Worms*).

Description and Life History.

Four species of stomach worms are known, of which two species, *Arduenna strongylina* and *Physocephalus sexalatus*, may be of some importance. Both these worms are whitish in colour, up to seven-eighths of an inch in length, and are found usually at the exit end of the stomach. Their life histories are similar and very interesting, in that the eggs, when passed out in the dung, are eaten by various dung-frequenting beetles. In these intermediate hosts the eggs hatch and the larvæ undergo certain development. The pig can only become infested when it eats the beetle containing the larvæ.

Control.

Control consists in the daily removal of all dung and the clearing up of all litter, &c., which might afford shelter to the beetles. No efficient drug is known which will remove the parasites, but oil of chenopodium, as recommended for *Ascaris lumbricoides*, might be tried.

The Large Round Worm (*Ascaris lumbricoides*).

This species is one of the largest roundworms known and may grow up to 15 inches in length. The parasite occurs in the small intestine and frequently in very large numbers.

Life History.

The eggs laid by the female worms pass out in the dung, and under suitable conditions of temperature and moisture become infective in about eighteen days. These infective embryos when swallowed by the pig hatch and the young larvæ immediately bore into the intestinal wall. From there they are carried in the blood stream to the liver, and still continuing their migration reach the blood capillaries, and are moved on to the heart, and from there to the lungs. About ten days after hatching the larvæ leave the lungs, move up the windpipe into the mouth, are swallowed, and reach the small intestine again, in which they settle down and grow to maturity.

Plate 77.—Stomach Worms (*Arduenna strongylina*). Natural size.

Effect on the Pig.

Only young animals up to four and five months of age are affected by Ascaris infestation. The larvæ burrowing through the liver and lungs cause serious disorders. Lung destruction may result in a condition of pneumonia, which may sometimes be fatal. A heavy infestation means a stunted and sickly animal, which becomes unprofitable. The invasion of the lungs by the migrating larvæ occasionally produces a condition known as "thumps," in which the breathing is laboured and bellows-like. More often, however, destruction of the lung tissue is shown by a short, hard, cough, which is especially prominent after exertion.

Control.

Treatment of infested animals with oil of chenopodium at the rate of 1 cubic centimetre for every 25 lb. weight to a maximum dose of 4 cubic centimetres will remove the majority, if not all, the worms from the small intestine. This drug is given with or immediately followed by castor oil, 1 to 2 oz. being used, depending upon the dose of chenopodium administered. The animal to be treated should be starved for twenty-four hours before and for four hours after the drug is administered. It is not advisable to treat animals under six weeks old. As one dose of chenopodium cannot be depended upon to remove all the worms from every pig, the dose should be repeated after an interval of ten to fourteen days.

Although oil of chenopodium is highly efficient in removing the worms from the small intestine, it is entirely without effect on the larvæ

I. W. Helmsing. 1929.

PLATE 78.

Fig. 1.—Large Round Worm (*Ascaris lumbricoides*).
Fig. 2.—Thorn-headed Worm (*Macracanthorhynchus hirudinaceus*).
Natural size.

in the liver and lungs, and in order to minimise losses through the presence of this stage in the life cycle, preventive measures must be adopted.

During its lifetime the female worm is said to lay as many as 27,000,000 eggs; and as these are very resistant to adverse conditions.

PLATE 79.

All these four pigs are from the same litter. The two smaller animals are infested with worms. The two larger animals are worm free. Note the difference in growth.

the sties and yards become so heavily contaminated with eggs that the animals swallow large numbers of infectious eggs every day. Sanitation is therefore the keynote of prevention. Daily removal of all dung, a good drainage system that keeps the yards and sties as dry as possible, the use of pens with concrete floors, and keeping the animals' food off the ground are all necessary for Ascaris control.

A system of pig-rearing in use in the United States has been highly successful in controlling, not only Ascaris infestation, but also infestations with other worm parasites. As Ascaris is harmful only to pigs up to four or five months of age, this method aims at keeping the young pigs away from the old contaminated yards till they reach this age. Certain modifications have been made which it is considered will make this system more practicable and more efficient under Queensland conditions.

Certain of the sties are set aside for farrowing purposes only, and it is essential that these have concrete floors. A few days before the sow is due to farrow the sty is given a thorough and careful cleansing and finally washed down with liberal applications of a boiling five cent. disinfectant solution. Kerol is recommended for this purpose, but in its absence any disinfectant with a high tar acid content, 25 per cent. and over, may be used. Make up the solution, boil, and without any delay apply it to the floor and walls of the pen.

Next, wash the sow with a warm soapy solution, remove all dirt and mud crusts, paying particular attention to the feet and udders. She should then be oiled to keep lice worry at a minimum, a second treatment being given after an interval of about fifteen days. In getting her into the prepared pen, she should be hauled and not driven.

After farrowing the sow and litter are placed either on fresh ground or ground on which pigs have not been running for a number of years. For this purpose three separate pastures are advised, each of which is subdivided. The one to be used by the young pigs should be previously prepared by sowing with a suitable forage crop, and in order to avoid any wastage of land the other two pastures could be given over to some profitable farm crop.

The period spent in the pen after farrowing depends on the number of sows farrowing. If only one or two sows are concerned, they and their litters may be placed in the pasture a few days after birth; but a three weeks' period is advised, for by this time the young pigs will be strong enough not to suffer through any possible robbing by their older and stronger fellows running in the same pasture. During these three weeks spent with the mother in the pen strict sanitation is necessary.

Only one division of the specially prepared pasture should be used, and when weaned the animals could then be placed in the second division, where they are kept till at least four months old. Next year, one of the two other pastures is used for the pigs, thus ensuring that each pasture does not run pigs for a period of two years, during which time it is considered that if proper cultivation practices are adopted very little infection, if any, would be surviving.

In cases where no such pasture land is available, the farmer is advised to remove the top 9 inches to 12 inches of the old contaminated soil from the yard attached to the farrowing pen and replace it with new, clean soil, preferably sand. Only the young pigs should be allowed to use this yard, the exits from the pen being made too small for the sow to pass through. Strict supervision should be given the cleanliness of the pen, which every two weeks should be given a disinfection with a boiling 5 per cent. solution of Kerol.

The Thorn-headed Worm (*Macracanthorhynchus hirundinaceus*).

Description and Life History.

This is also a large species occurring in the small intestine, the female worms attaining a length of 7 to 16 inches. The parasite is whitish in colour, and its head is provided with an armed proboscis with which the worm attaches itself to the intestinal wall.

The eggs are passed out in the dung, and for the life cycle to be completed must be consumed by certain beetle grubs. The eggs hatch in the intestine of the grub, and the young larvæ forcing their way through the intestinal wall reach the body cavity, where they encyst. The pig, in rooting about, finds the grubs and eats them. The encysted worms are released and attach themselves to the wall of the small intestine by means of their proboscis, and eventually reach maturity.

Effect on the Pig.

The thorn-headed worm is fortunately not very common, but moderate to heavy infestations are sometimes seen. The worms are

continually moving about in the small intestine and reattaching themselves, and consequently severe damage to the intestinal wall is occasioned. The infested animal shows evidence of great pain, may be subject to nervous disorders, and rapidly loses condition.

Control.

There is no drug known that can be depended upon to remove these worms, but the treatment as recommended for Ascaris may lessen the infestation. Strict sanitation must be maintained, and anything that will prevent the pig rooting around and eating the beetle grubs should be considered.

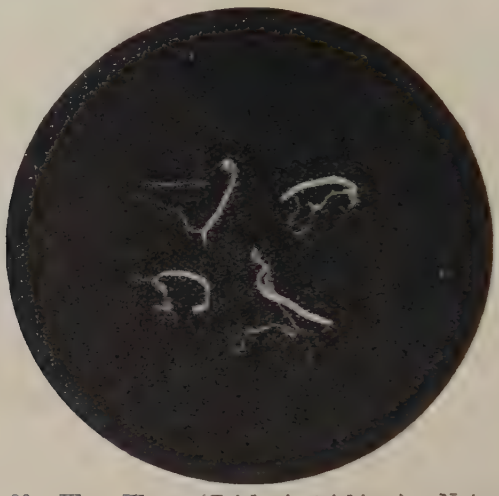


Plate 80.—Whip Worm (*Trichuris trichiura*). Natural size.

Whip Worm (*Trichuris trichiura*).

This parasite gets its common name from its resemblance to a whip, the anterior portion being thin and thread-like, and the posterior portion comparatively stout. It is found in the caecum and adjoining portion of the large intestine, and may measure from 1½ to 2 inches in length.

The eggs laid by the females pass out in the dung, and under suitable conditions of temperature and moisture develop into infective embryos. On being swallowed by the pig these infectious eggs hatch, and the young larvæ, making their way to the caecum and large intestine, reach maturity in sixteen to twenty days.

Control.

The whipworm is an exceedingly common species, and it is considered that a heavy infestation may be distinctly harmful. Repeated treatments with oil of chenopodium may give results, but owing to its location so far back in the alimentary tract the worm is difficult to reach with vermifuges. The sanitary measures as recommended for Ascaris should be applied for whipworm control.

Nodule Worms (*Œsophagostomum* spp.).

Description and Life History.

Two species of nodule worms are known, *Œsophagostomum dentatum* and *O. longicaudum*, the latter being comparatively rare. Both

occur in the large intestine, are whitish or greyish in colour, and may measure up to three-quarters of an inch in length.

The eggs, in this case, after passing out in the dung, hatch, and the young larvæ feed in the dung for several days before reaching the infective stage. The larva is now enclosed in a sheath which helps to protect it from adverse conditions. When swallowed by the pig the larva loses its sheath and burrows into the wall of the large intestine, causing the formation of a small nodule. After a period of development in the nodule, the larva eventually breaks out and settles down in the intestine and grows to maturity.

Plate 81.—Nodule Worm (*Œsophagostomum dentatum*). Natural size.

Control.

Nodule worms are most harmful to young stock, and a heavy infestation may result in general unthriftiness. No treatment with drugs is known to be effective for nodule worm, and the only control measures are concerned with sanitation.

Lung Worms (*Metastrongylus* spp.).

Description and Life History.

Two species of lung worms are known, *Metastrongylus apri.* and *M. pudendotectus.* Both are long, thread-like worms from 1½ inch to 3 inches long, occurring in the air tubes of the lungs.

The eggs which are laid by the females contain active embryos which hatch in the lungs. The larvæ may be swallowed and passed out with the dung, or else may reach the exterior in the nasal and bronchial discharges. Before its development can be completed the larva must now be swallowed by an earth worm, the pig becoming infected when it in turn eats the earth worm.

Effect on the Pig.

A light infestation causes no appreciable harm, but when in numbers, and especially in young pigs, the worms may cause a bronchitis char-

acterised by a short, husky cough, and sometimes followed by pneumonia. The infested animals rapidly lose condition and, if bacterial complications arise, may die.

Plate 82.—Lung Worm (*Metastrongylus apri*). Natural size.

Control.

Should an outbreak occur, the unaffected pigs should be immediately removed and the infested animals given good, clean water, nourishing food, and warm quarters. Good nursing is the best treatment for lungworm infestation. All conditions permitting the presence of earth worms must be attended to, and sanitation again is necessary for an efficient control of these parasites.

Kidney Worm (*Stephanurus dentatus*).

Description.

This parasite is given the popular name of kidney worm because it is found in the vicinity of the kidneys. Mature worms are seen in the flare fat and occasionally in the kidneys themselves, while young stages

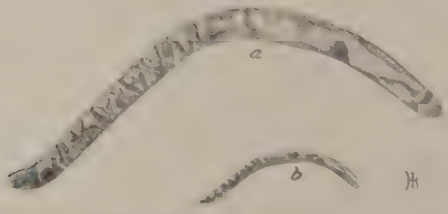


Plate 83.—Kidney Worm (*Stephanurus dentatus*).
(*a*) Three times natural size. (*b*) Natural size.

of the parasite, whilst most prominent in the liver, may occur in the lungs and various other parts of the body. The kidney worm has a very distinctive mottled appearance, is relatively stout, and may grow up to 2 inches in length.

Life History.

Only those females inhabiting the kidneys or kidney fat are sexually mature, and these lay eggs which eventually reach the exterior in the urine. The eggs hatch in one to two days, and five to eight days after hatching the young larvæ are ready to infest the pig. As in the case of the nodule worm, the infective larva is enclosed in a sheath. The pig becomes infected by swallowing these infective larvæ, or infection may occur through the larvæ burrowing through the skin. In any case, the young worm eventually reaches the liver, where it remains for some months. After a period of five to six months the worms are mature, and leaving the liver migrate to the kidney fat, where, if females, they commence to lay eggs.

Effect on the Pig.

Heavy infestations result in an unthrifty animal, owing mainly to the extensive damage to the liver caused by the young worms. It is one of the most widespread parasites of the pig in Queensland, and is certainly a cause of serious wastage. The condemnations of pigs' livers and infested carcasses for export purposes and the unthriftiness of infested pigs is regarded as one of the most serious economic losses the pig industry in Queensland has to contend with.

Control.

Owing to their location in the vicinity of the kidneys, these parasites cannot be removed by drugs given via the mouth, and only preventive measures will bring about a satisfactory control.

As the eggs and larvæ are rapidly killed by sunlight and dryness, yards and sties should be efficiently drained and kept as dry as possible. All depressions and mud holes, especially those in the shade, should receive attention, and if these cannot be kept dry they should be sprayed weekly with a 5 per cent. Kerol solution at the rate of 10 gallons of Kerol per 100 square yards. Sties should be built of concrete, or else have slatted floors, which allow the urine to drain through to the ground beneath. All litter should be constantly cleaned up, as the soil so protected forms one of the most favoured sites of the infective larvæ. Yards and sties spelled for six months may be used with safety, as larvæ cannot survive for this period, even under optimum conditions.

The system used for Ascaris control may be applied here with certain modifications. The pastures are prepared as already stated, ploughing and cultivation being very efficient in cleaning the land of infection. The food and water troughs in this case, however, are placed on bare, well-drained areas. The food troughs may be shaded, but the surrounding bare areas must be well exposed to sunlight. After feeding or drinking, the majority of the urine is then passed on this bare exposed land, and the eggs and larvæ are rapidly killed by the sunlight and dryness. Paths used by the pigs throughout the pasture should also be kept bare and well exposed.

SANITATION.

It has been aptly remarked that the harm resulting from worm infestation in pigs would be considerably reduced "if pigs were kept in a less swine-like manner." Without sanitation little can be accomplished in the control of any parasite. Even though treatment with a drug may be depended upon to remove all worms, there is little advantage in its use if the animals are able to become reinfested immediately after-

wards. So far as the pig is concerned, prevention assumes an especially prominent place in worm parasite control, for there is only one species for which an efficient vermifuge is known. This species is *Ascaris lumbricoides*, and even here treatment is of no effect against the more harmful phase in the life cycle—namely, the migrating larva. This point emphasises the need of good sanitation, which, by the elimination of conditions favouring the development of the life cycle stages spent outside the pig, considerably reduces the chance of infestation. The principals of good sanitation are outlined herewith:—

1. *Sties.*—In the construction of a sty the farmer should aim at concrete floors. The initial expenditure may be high, but the result is shown in the ease with which such sties may be kept clean and the subsequent good health of the pigs. Earthern floors in sties should be entirely abolished, as it is impossible to keep them clean and dry.

2. *Dung.*—All dung should be removed daily. The dung carries the eggs of those parasites inhabiting the alimentary canal, and its regular removal and disposal is important. If desired for fertilizing purposes, it should be spread out immediately in the pastures. It must be understood that pastures so treated should not be accessible to the pigs; otherwise the dung should be buried under 1 foot of soil. Pig dung is a favoured breeding medium of the house fly, which, when in numbers, not only becomes an annoyance to the animals, but also plays a very prominent part in the spread of disease. The proper disposal of the dung is important from this aspect also.

3. *Drainage.*—Moisture is a necessary factor for the development of the free living stages of all worm parasites, and in its absence very few of these can survive for any length of time. A good drainage system is therefore an essential for good sanitation, and the progressive pig raiser will see that all depressions are filled in and that mud holes are not permitted. If wallows are considered necessary, they should be built of concrete and frequently cleaned out and disinfected.

4. *Feeding.*—No food should be thrown on the ground, but supplied in sanitary food troughs. These are best built of concrete, evenly divided by round iron cross pieces, to prevent the animals lying in them. In yards, such food troughs should be surrounded by a concrete floor raised above the level of the ground and sloping away from the trough. Hoppers are advised for dry rations.

5. Keep the runways and yards as free of litter as possible. Accumulations of corn cobs, &c., protect any infection in the soil beneath from such adverse conditions as sunlight and dryness.

THE ADMINISTRATION OF VERMIFUGES TO PIGS.

It must be remembered that the pig has a peculiar narrow throat, and great care must be taken when administering drugs. With liquids the danger is somewhat increased, as they are apt to enter the lungs and suffocate the patient. Oil of chenopodium and castor oil may, however, be administered quite safely if the directions given below are carefully followed. The required amounts of the drug and castor oil are measured out and thoroughly mixed. Young animals are set up on their tail and

between an assistant's legs, the mouth opened by a spreader or gag, and the vermifuge administered very slowly over the back of the tongue by means of a syringe with a long curved nozzle (Plate 84, fig. 1). *The liquid should be given slowly and ample time given the animal to swallow.* Care should be taken not to force the head up too far.

Animals too big to be handled in this way are best placed in a crate or crush. A leather strap is used to elevate the upper jaw and bring the mouth level with the shoulder tops, the drug being then administered with the syringe in the manner described above. Failing a syringe, an old boot from which the toe has been removed is occasionally used for

Plate 84.—Drenching a Pig for Worms.

administering liquids; but with the syringe the work is quicker and each animal is given a full dose.

Oil of chenopodium may also be obtained in capsules. It is not always an easy matter, however, to dose pigs with capsules, and as, in any case, the capsules would have to be followed by castor oil, it is considered that the simultaneous administration of the drug and castor oil is much easier for the operator.

The administration of chenopodium in food is sometimes recommended, but cannot be considered as nearly as efficient as individual treatment with the syringe.

The Control of Insect Pests of Sugar Cane.

By R. W. Mungomery.

IN common with almost all other plants, sugar-cane is attacked by a number of insects, the combined effect of which tends to weaken the plant and prevent to a greater or less degree the full functioning of its roots, stalks, and leaves. Thus, to cite a few examples:—"White grubs" attack the roots and underground portions of the stalk, and deprive the cane stool of its means of maintaining its normal supply of plant foods and water. Borers feed on the more succulent internal fibres of the stalk and interfere with the ready circulation of sap between roots and leaves. At the same time the tunnels of these borers, having access to the outside air, provide an easy entrance for certain fungi which cause serious internal rots. Caterpillars and grasshoppers at times consume almost the entire leafblades which are the "factories" wherein the cane sugar is manufactured. Evidently, therefore, any serious attack by an insect results in a curtailment of the plant's activities, and this is automatically reflected in reduced crop yields. It is true that the effect of some insects found attacking cane is almost negligible, whilst others, although potentially dangerous, are never present in sufficiently large numbers to cause noticeable damage. However, when insects become so abundant as to compete seriously with man in his efforts to raise crops, they then become pests, and some form of control must be instituted against them to prevent or restrict their damage.

The fundamental principles of insect control can be considered from four main standpoints, and these will be reviewed in their possible application to the control of sugar-cane insect pests. Such control measures may be divided into what may broadly be termed (1) cultural, (2) chemical, (3) biological, and (4) legislative methods.

CULTURAL CONTROL.

Cultural methods of control are such that, by some variation of, or concentration on a particular farm practice, the agriculturist aims at constantly placing the insect pest at a disadvantage, and either minimises or completely counteracts its otherwise harmful effects. Cultural methods of control are those which have been gained from the common experience of man in his fight against the many insect pests found damaging his crops. They may be classed as methods which usually readily suggest themselves and are more or less common knowledge, and for that reason they are most frequently put into operation to combat pests. Some of these farm practices may be summarised as follows:—

Summer Ploughing: It is well known that many soil frequenting insects are located in the upper soil levels during the warmer months of the year, whilst during the cold winter period they are found in a more or less inactive condition usually below plough level. Therefore, if ploughing be carried out during the summer, a much greater check is imposed on these insects than if the same operation were carried out during the winter.

Collecting and Hand-picking: The systematic collection of beetles from feeding trees in compact areas has generally been acknowledged to bring about a satisfactory reduction in the incidence of grubs during the following season; but in broken country, where collecting must of necessity be extensive and, at best, incomplete, the benefits to be derived from this practice are

doubtful. In some of the Southern areas boys are employed to follow behind single-furrow ploughs and to collect any grubs that may be exposed in the furrows. Provided this work is carried out thoroughly, it is possible so to clean the land that two or three crops may be grown subsequently without any serious grub damage. These remarks apply of course to the grubs with the two year life cycle which is characteristic of the Childers cane grub.

Excision: This form of control is sometimes employed against moth borers in parts of the West Indies and Java where labour is cheap, but this rather tedious practice finds little favour in Queensland.

Field Sanitation: The elimination of weeds and grasses is a common agricultural practice which tends to reduce insect infestation, some pests being originally attracted by untidy overgrown fields. Such a measure directly reduces the breeding grounds of moth borers and many sap-sucking insects, such as aphids and leafhoppers, which are the natural transmitting agents of many virus diseases, and it indirectly prevents the rapid spread of these diseases. Mosaic disease of sugar-cane is a notable example of a disease whose spread is influenced in this way by the presence of grasses.

Variation of Planting Date: Early or late planting to avoid pest damage is a point frequently stressed. In the former case, the crop is past the susceptible stage, or matured, before the pest is capable of doing any appreciable harm; in the latter case, the pest is usually full grown and about to enter a quiescent stage of its cycle when the crop is planted, and similarly, serious damage is obviated. In North Queensland it is generally agreed that late-planted crops are less subject to bad grub attack than the taller early-planted crops. Around the Mackay district, wireworm damage is, to a point, less severe in late planted blocks than in those planted early. In South Queensland, autumn planting usually ensures a good strike and freedom from a number of pests, whilst spring planted cane frequently suffers damage.

Resistant Varieties: Deep rooting varieties of sugar-cane such as some of the P.O.J. canes and D. 1135 are much more resistant to grub attack than are shallow rooting varieties such as Q. 813. Again, canes with a hard rind are less subject to rat and borer damage as compared with canes of the softer and more succulent types.

Burning of Cane Trash: This system is largely practised throughout Queensland, where it aids considerably in reducing the numbers of beetle borer, which would otherwise migrate to surrounding fields and commence new centres of infestation. It should always be borne in mind, however, that such practices simultaneously destroy the Tachinid parasite, and where this fly is established burning of trash is not to be recommended as a form of borer control. The disposal of trash in this manner also tends to reduce the incidence of army worms, but again these may be successfully and economically controlled by the use of poison baits.

The Rotation of Crops: Crop rotation is a desirable form of control when dealing with insects which attack only one of the crops under rotation, but in Queensland, with the possible exception of a few of our minor cane pests, it is doubtful whether this measure would afford any relief from our more serious cane pests.

Mechanical Methods: The use of implements in the field has been developed to a greater extent in Queensland than in any other sugar-producing country, and it is not surprising that the idea of obtaining a high degree of insect control has been incorporated in the building of some of the machines which are used in the ordinary course of cultivation work. In this connection we refer to an improved rotary hoe with the rotor revolving at a high speed, pulverising the soil to a depth of 7-8 inches, and

chopping the ground every 2 inches as the machine moves forward. With this implement a kill of 92 per cent. of the grubs present in the top 8-inch soil level has been obtained, and it is thought that with a few minor alterations, such as increasing the number of blades and thereby securing a finer cut, its efficiency might be even further increased. It is capable of treating 3 acres per 8 hours at a cost of approximately £1 per acre, and it has already resulted in a considerable saving in cleaning up grub-infested areas.

CHEMICAL CONTROL.

Chemical control consists essentially of the direct application of chemicals to kill insects, and naturally their use is governed largely by the relation between the cost of the chemical and its application, and the amount of profit that can be expected from the crop in question. Chemicals may be used as insecticides in the form of stomach poisons, contact poisons, or fumigants. In the case of poisons, the type of insecticide to be used depends chiefly on the mouthparts of the insect to be controlled; i.e., whether they are of the biting and chewing type such as those of grasshoppers and caterpillars, or whether they are of the suctorial type such as those of leafhoppers and aphids. Pests having chewing mouthparts are controlled by spraying or otherwise finely coating their food plant with some poisonous compound such as Arsenate of Lead or Paris Green, so that when feeding on these plants they consume a quantity of the toxic compound which ultimately result in their death. In America, when grub-proofing lawns and golf greens, it is customary to mix quantities of lead arsenate with the soil when the greens are being made, or subsequently as top dressings, and any soil insects which happen to ingest this soil are soon killed by this poison, which remains effective for many years. Insecticides are sometimes mixed with a carrier such as bran or sawdust to which attractive substances such as molasses and lemon juice are added, and the whole mixture broadcasted in areas where the pest has assumed importance. The well known bran poison bait is an example of a successful bait used to overcome army worm infestation.

Such methods are of no use in the case of insects with suctorial mouthparts, since they ingest juices from within the plant. They are usually controlled by means of a contact spray such as nicotine sulphate or various emulsified oils, all of which adversely affect their breathing organs and soon bring about death.

Fumigants are another popular form of control. In most cases they possess anæsthetic and asphyxiating properties, which act very rapidly on the vitality of the insects, causing paralysis, and if the insects are forced to remain in this atmosphere they soon die. Fumigants to be used successfully must be used intelligently. For instance some, such as carbon bisulphide, are heavier than air and must be released above the insects which are to be controlled; others such as hydrocyanic acid are lighter and must be placed in such a position that the rising fumes will overpower the insects and cause their death.

Soil fumigation is one of the surest means of dealing with the greyback cane grub, in that the pest is attacked at the place where it will cause its greatest damage, and if fumigation be carried out whilst the grub is still in its early stages, the cane stool will suffer very little injury. In Queensland, it has been customary to use a mixture of carbon bisulphide and paradichlorbenzene as a fumigant for the control of the cane grub. This fumigant is injected into the soil by means of a Dank's or Vermorel Injector, a measured quantity being injected at each stroke of the plunger which is operated by pressure with the hand.

BIOLOGICAL CONTROL.

The forces of nature if left to themselves tend towards a state of balance, and no one plant or animal can continue to increase in over-whelming numbers for any great length of time. If an insect pest increases abnormally over a number of years, a host of forces attack it from all quarters, and soon reduce it to its former status. These forces consist in adverse weather conditions, diseases, parasitic and predaceous insects, birds and animals, etc. Man has no control over some of these forces, such as the weather conditions, but he is able to utilise some of the other agencies in the control of certain pests which have increased abnormally in different parts of the world. This form of control is usually referred to as "biological control" and is applicable chiefly to the control of foreign pests which have accidently gained entry into another country. Under such circumstances it is usual to search for the death factors which keep the insect in check in its original home, and having selected the parasite or parasites which are considered to be the most effective, these are bred artificially, freed of all hyperparasites, and introduced into the country where the pest is to be controlled. Biological control is an ideal form of control in that friendly organisms aid in the suppression of the pest without any concerted effort on the part of man other than that of providing suitable conditions for the develoment of the parasite. This form of control is most successful in insular areas such as Hawaii and Fiji, where the fauna is limited and where introduced insects are not subjected to attack from a vast array of hyperparasites, etc., with which they might have to contend in larger continental areas carrying a larger and more varied insect population. In Hawaii, the control of the sugar-cane leaf-hopper and the Anomola grub have been outstanding successes in biological control when other forms of control seemed futile and the sugar-cane industry of these islands was threatened with imminent extinction. These cases were amongst the earlier attempts to utilise biological control, and their brilliant success has done much to popularise this form of control. In more recent years the spectacular control of the Levuana Coconut Moth in Fiji, by a fly originally parasitic on the caterpillar stage of a closely related moth in the Federated Malay States, has been one of the greatest achievemnts in the biological control of an insect which threatened the existence of the coconut industry, and which defied almost all other means of control.

Within our own industry we have an excellent example of biological control in the suppression of the sugar-cane beetle borer by the Tachinid fly parasite. This borer pest, which is a native of New Guinea and the neighbouring islands, gained entry into Queensland in the early settlement days when the sugar industry was being established. At that time indiscriminate introductions of cane were made from other countries without adequate quarantine restrictions, and it was in this way that the pest became established. In their native New Guinea the sugar-cane and its parasite had been associated for centuries and had attained a state of adjustment in which there appeared to be no danger of the pest increasing to such numbers as to become a serious menace to its host. On the other hand it quickly became apparent that in some of the wetter districts of North Queensland the borer, unless controlled in some way, would soon prevent the growing of all canes of the desirable soft, sweet types.

In seeking for a means of controlling this pest it was therefore natural that a search should be made for the probable parasites which restricted its numbers in New Guinea. This search was largely directed by the late Frederick Muir of the Hawaiian Experiment Station and soon led to the introduction of the Tachinid fly into Australia. This parasite has since been

bred in large numbers by the Entomologists of the Bureau of Sugar Experiment Stations and has been liberated by them wherever the beetle borer has been found, and it now exercises a high degree of control over that pest where climatic and other conditions are favourable.

However, these brilliant economic successes do not present the whole picture of biological control of insect pests. In this phase of endeavour, perhaps more than any other, the path to successful achievement is strewn with the remains of optimistic attempts which have ended in abject failure. Biological control does not consist in rushing off to a foreign country, bringing back a number of parasites, and letting them loose upon the unsuspecting pest; to ensure the success of biological forms of control a whole complex of factors must be inter-dependently favourable. Such a project is not to be embarked upon light-heartedly, but only after the most mature consideration, since a false step may have most disastrous economic consequences through the upsetting of the whole biological balance. Therefore we will now review some of the conditions necessary for the effective operation of biological forms of control and, equally important, some of the reasons why it cannot be universally applied.

It will be evident that a parasite cannot entirely destroy its host (i.e., the species on which it completes its development) for with the gradual elimination of the host, and the increase of the parasite, a point is ultimately reached where the number of parasites is greater than the remaining hosts, with the result that many parasites fail to find a host for the development of their young, and these die without reproducing. Consequently a reduction in the number of parasites soon follows a reduction in host population, until there is reached a point of partial equilibrium whereat the pest does not increase greatly before a corresponding increase takes places in the number parasitised.

The limiting factors operating against the successful working of a parasite may be a question of climate, or the kind of crop infested by the pest, and upon this latter factor depends the parasite's ability to locate its host. In the large continental area of America over which the Japanese beetle has spread, we find that in certain districts a wasp parasite is the most efficient of the many introduced species, whilst in other parts a fly parasite contributes largely to its control. Reverting once more to the parasite of the beetle borer, we find that this fly is able to exercise its greatest degree of control in erect cane, whilst in cane that is lodging badly the fly is unable to penetrate the dense layer of trash in search of borer grubs, and therefore control becomes reduced. It is also interesting to note in this connection that Veitch found the parasite to work very efficiently in the rainy districts of Fiji, whilst in the drier zones of the same island colonies of this fly parasite, which resulted from similar sized liberations, almost invariably died out. In Queensland we find that this parasite is favoured by similar conditions, and it is well established in the moister districts such as Babinda and South Johnstone, whilst its establishment in the drier areas has been more difficult and less permanent. During the coming years, it is proposed to attempt to overcome these difficulties by liberating many thousands of these flies in borer-infested localities; data will be collected on subsequent control, and in this manner it is hoped to gain a clear idea of the degree of control that can be expected, and to evaluate the limitations of the parasite under varying conditions.

Biological control of army worms is also an important illustration to Queensland growers, especially in view of the fact that from a knowledge of the degree of parasitism being suffered by the pest they are advised whether it is considered justifiable to bait the pest, or whether to take no further

steps other than to allow the infestation to be cleaned up by parasites in the normal way. In certain seasons (for instance, 1932 in South Queensland) the pest has been very bad, and has threatened to ruin young ratoons wherever trash was conserved. In this particular year the droughty weather and the harsh winter had adversely affected the parasites, and the pest was able to breed up in large numbers practically unmolested. In late October the parasitism suffered amounted to only 10-15 per cent., and consequently bran poison baits had to be used to check their depredations. Hence the limitation of parasite control under a certain set of conditions will be apparent. However, during the past year in the same areas, larger fields of trash have been conserved, but a milder winter has been followed by a more rainy spring. Army worm damage has been very light—certainly insufficient to warrant extensive artificial control measures being instituted against them, and the parasites have been able to cope with the pest in an entirely satisfactory manner.

The most recent attempt of the Bureau to bring about biological control by means of introduced parasites has been directed against the Isis cane grub in South Queensland. For this purpose a Dexiid fly has been introduced from Canada on two occasions during the past two years. In Canada, this fly normally attacks a grub very closely allied to our cane pest. Small isolated fertile areas, such as the Isis district, surrounded by tracts of less fertile forest country, and which carry an insect fauna totally different from the surrounding one, have been likened to islands and are termed biological islands. It is thought that an introduced parasite, if once established, might become more efficient under such circumstances and less liable to suffer attack from insect parasites than if the same insect were introduced into a large continuous belt of similar country, carrying a varied insect population, and where it might be subject to attack from many quarters. Hence, one of our reasons for attempting to establish the Canadian Dexiid in the Isis district. Conditions for the liberation of this Dexiid were not however satisfactory, since drought conditions prevailed during 1931-32, and during 1932-33 host grubs were relatively scarce. It is yet premature to attempt to ascertain whether the parasite has become established or not, since very few of such initial liberations show definite results for some years, but this liberation will be watched closely and collections of grubs will be made periodically to ascertain if the parasite is actually breeding in this new locality. With regard to the time taken for a parasite to become effectively established, an extreme case is on record where a parasite introduced into America to control a certain fly pest was apparently ineffective, and was not recovered for twenty-one years after its liberation, but at the present time it is regarded as the most efficient natural controlling agent of this pest.

In the case of the "greyback" cane grub, the hope of attaining any appreciable increase in parasitism by the introduction of a foreign parasite does not appear very promising in the light of our present knowledge of the pest. This insect is indigenous to Queensland, and in its natural state the grubs fed on the roots of native grasses and other plants more especially in "scrub country." With the planting of these fertile jungle areas with sugar-cane, the greyback has been favoured with a set of conditions pre-eminently suitable for its wholesale multiplication, and it is now found in pest proportions from Mossman in the north to Carmila as its southern limit. Thus, the area covered by this pest, in contradistinction to being of the biological island type, is more truly of the continental type, and in this large expanse it is attacked by a considerable number of natural parasites, which in their turn are kept in check by hyperparasites, rendering them more or less ineffective. Hyperparasites are not, as a rule, specific, and they would in all probability turn their attentions to any new importations we might make,

and render them equally impotent. Further, since there are no overlapping generations, and the period of activity of any one of the stages in the life cycle of the greyback is relatively short, it is probable that an introduced parasite would require an alternate host to maintain it throughout the corresponding period of its cycle when grubs are not readily accessible. This necessity for an alternate host is considered to be a distinct disadvantage, since the parasite would then divide its activities between two or more species of grubs, rather than concentrate on the one pest whose numbers we wish to materially reduce. However, this side of the question will be further investigated with a view to discovering any circumstances which might justify our proceeding with such a desirable form of control.

Hitherto we have dealt with biological control from the point of view of control by insect parasites, but it is well to remember that diseases often take heavy toll of dense insect populations. These diseases are, however, rather unreliable, and are usually dependent for their wholesale development upon a set of favourable weather conditions. Birds, too, are generally regarded as being of great assistance to man in keeping down his insect enemies, and one has only to watch a flock of ibises following behind ploughs and ridding the land of soil-frequenting insects to be convinced of the numbers they are able to destroy. Crows also are assiduous grub eaters, but in some seasons when food is plentiful they are somewhat diffident in following the ploughs. Other smaller birds often show a decided preference for the smaller parasites and predaceous insects, and their importance as grub destroyers appears to have been overrated in certain instances. In the West Indies, the giant toad, *Bufo marinus*, is believed to exercise a very appreciable degree of control upon the beetle stage of "white grubs." This animal has recently been introduced into Hawaii and we are watching its activities closely with a view to its introduction into Queensland.

LEGISLATIVE CONTROL.

Legislative control is preventive rather than remedial, and the institution of a strict quarantine aims at preventing the importation of foreign pests. Although most of our serious sugar-cane pests are native ones which have turned their attentions to cane, a notable exception is the sugar-cane beetle borer, which originally came from New Guinea, and we might well ask ourselves how much better off some individuals might be if they were not embarrassed by the presence of this pest on their farms. Other important pests are to be found in nearby sugar-producing countries, but these we fortunately have not yet acquired. However they remain potential sources of danger if attempts are made to evade the State quarantine regulations, or if the indiscriminate introduction of new varieties were permitted. With the quicker modern methods of transport, and the extended use of aerial travel, the chances of foreign pests being imported into Australia appear to be considerable, despite the existence of rigorous quarantine restrictions, and if some of these pests became established our sugar industry might suffer serious losses before they could be brought under effective control. Again, some of our resident pests have not yet succeeded in becoming established throughout the whole of the sugar districts of Queensland. Whether this was due to previous unsuitable conditions, or to the happy circumstance that none of these pests were ever introduced into clean areas with the exchange of planting material, is more or less a matter of speculation at the present time. However, with the extension of irrigation in some of the drier belts, and the consequent production of larger crops, uncontrolled interchange of plants might easily result in the spread of some of these pests to areas far beyond their present limits, now that conditions in these latter districts appear to be more suitable for their establishment. To guard against any

such occurrence, inter-district quarantines have been established, involving eight major districts, and a proclamation has been issued prohibiting the removal of cane for planting purposes from one major district to another, unless under permit from the Bureau of Sugar Experiment Stations. In order further to discourage the transport of varieties from one district to another there has recently been enacted an amendment to the Cane Prices Act whereby there is required to be published each year a list of the varieties which are approved for each mill district, all other varieties being automatically disapproved and subject to penalties. This amendment is intended to remove the incentive for variety fanciers to collect canes from all over the State, a practice which has already had the most serious consequences in spreading diseases to new localities.

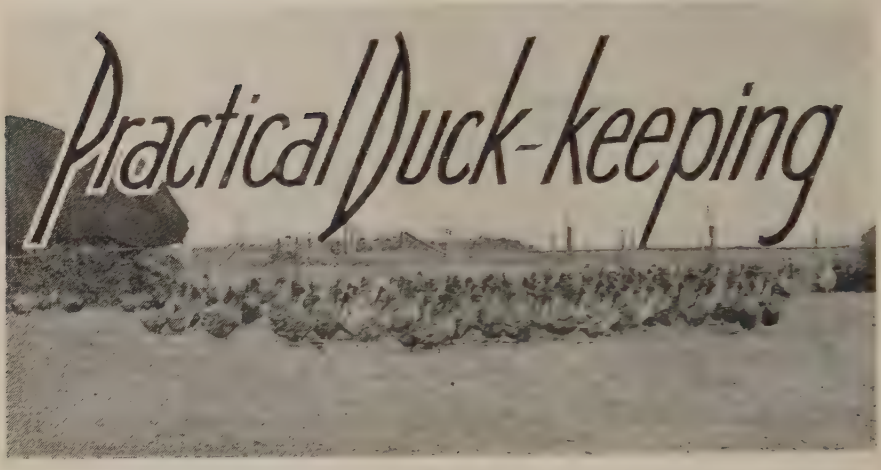
Such laws are of little avail unless they are backed up by a well informed and well disposed public opinion. The spread of insect pests constitutes a real danger, and all growers and others interested in the welfare of the sugar industry should accord their sympathetic co-operation in the enforcement of any measure aimed at pest restriction.

PULLING OUT FENCING POSTS.

This illustrates a method of pulling out fence posts. This fulcrum, having two legs, stands firmly on the ground, with the top against the post which is to be pulled out. The horse can pull a dozen times without the position of the fulcrum being affected. Having a lean against the post, it makes the task of lifting the post easy in every way, and lighter on the horse. The fulcrum should be about 4 feet long,

Plate 85.

and it is all the more effective if it has a bend. The two bottom ends should be about 2 feet apart, and placed, say, 2 feet 6 inches from the post. It is advisable to cut them so that they will hook into the ground, and not slip. A V should be cut in the top of the fulcrum and a pin inserted without a head, so that it will fit into any link of the chain, which should be made as tight as possible between the top of the fulcrum and the bottom of the post. Aided by this contrivance a man, with a good horse, can easily pull out a mile of fencing a day.



By J. J. McLACHLAN, F.B.S.A., Poultry Inspector.

IN Queensland, ducks are chiefly kept for table purposes, although quite a number of small flocks are kept for egg production. There are very few specialised duck farms: the usual practice is to keep a flock of ducks as a farm sideline. The market for table birds is usually kept fairly well supplied from existing sources, high values are therefore not regular. Reasonably high prices are, however, obtainable when the demand is firming for the Christmas trade. This fact indicates the necessity for a continuous supply of cheap foodstuffs suitable for growing ducks destined for the table. The keeping of ducks for egg production is not practised extensively in this State; this is possibly due to the unpopularity of the duck egg, making it somewhat difficult to market. It is all a question of taste, for a duck egg is equal to a hen egg in food value, and, provided the birds are fed on good wholesome food and kept under strict sanitary conditions, it would be fairly difficult to distinguish any difference in general quality. Ducks are more prolific layers, have a longer profitable life, are more easily reared, and are freer from disease than other poultry.

The foremost breed is the Muscovy: this bird is essentially a table bird, and may be found all over the State. The Muscovy is distinct from all other breeds of ducks and will always remain distinct, for if this breed is crossed with any other breed of ducks the progeny will be mule ducks.

THE MUSCOVY.

General Characteristics.

The head is large, and at times it raises the feathers in fan shape: the beak is thick, with a band of reddish colour, the nostrils and the face being covered by caruneulated flesh; the eye is brown; the neck is thick and of a fair length. The body is a great frame, rectangular in shape and nearly horizontal, short and powerful in leg, with fairly large feet, webbed to end of toe, with powerful claws. The male has no curled feathers in the tail, as other breeds; his plumage is of a brilliant bronzy black, with a green sheen. Legs of both sexes are black to the toes.

The female is similar to the male, but only half the size, without the wrinkled flesh around face, and duller in plumage than the male.

Plate 86.—A Typical Muscovy Duck.

Size.

The average weight of the drake is just over 12 lb., but many reach 14 lb. and over. The duck, however, is less than half the weight of the drake, and it is a very large duck which attains 6½ lb., the average being about 5 lb. The adult drake is enormous—measuring frequently 32 to 34 in. in length; it walks slowly and heavily.

INDIAN RUNNER.

General Characteristics.

Of the egg-producing ducks, the Indian Runner predominates in numbers. But the Khaki-Campbell is becoming very popular and is equal as a layer, whilst it is slightly heavier in body weight than Runners.

Head.—Fine and somewhat flattened over the skull, with the eyes full, bright and clear, showing alertness, and situated high up in the skull. Bill strong and deep at the base where it joins and fits almost insensibly into the skull, and thence comes as nearly as possible straight down to the tip, giving it a wedge-shaped appearance, of good average length.

(*Note.*—The shape is more important than actual length or width, and it should be proportionate to the build and size of the bird and well set into the head at the junction. Very flat or dished bills with rounded under-line are objectionable, and abnormally long heavy bills are liable to be accompanied with coarse heads and thick necks, which are serious faults.)

Neck.—Neck very fine, thin and slender to where it begins to form the expansion towards the base of the neck, which expansion should fit almost insensibly into the upper part of the body, so as to appear almost part of it, the head and neck carried high and slightly forward, and not curved or carried swan-like.

Body.—Body—the lower portion of the neck expansion is included—long and narrow, of nearly uniform thickness, very tightly feathered.

Wings closely packed; approximately about twice the length of the neck to the top of the head. When standing erect, the stern appears comparatively short and curves round to the tail, which is close and neat, and in the best specimens carried nearly in a line with the body, but in some excellent birds it is slightly elevated or turned upwards, and a fullness of the lower stern is frequent in the most prolific layers.

Legs.—Legs placed much farther back than in other breeds of domestic ducks. Shanks comparatively short, with small supple feet and strong thighs to enable the bird to balance properly and maintain an upright position when on the run.

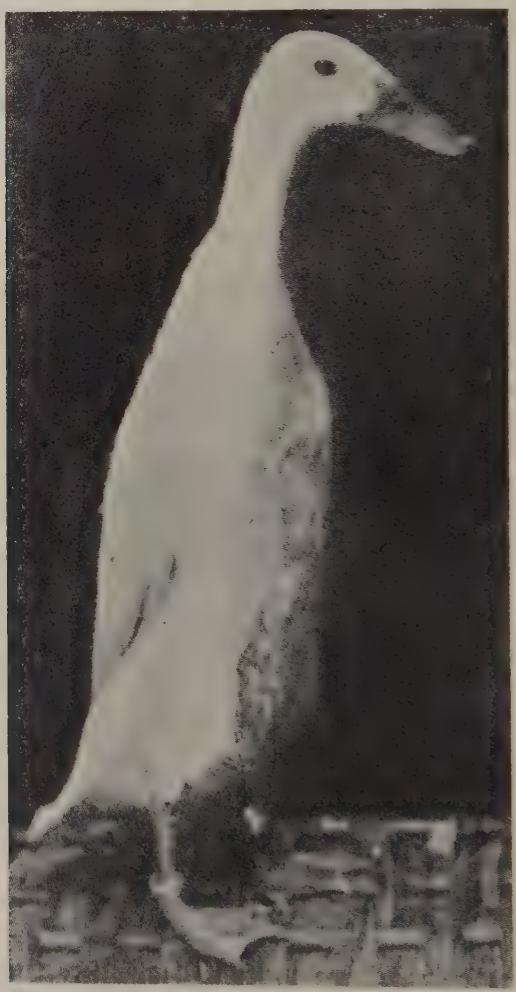


Plate 87.—White Indian Runner Duck.
Note upright carriage which is characteristic of this breed.

Length and Size.—As layers of a great number of large eggs, substance and constitution are necessary in the breed; small, square specimens are useless, while heavy bulky birds are less active as foragers

and open to the same objections. A medium size with good reach and perfect symmetry is advisable, but appearance and activity should be a truer guide than actual weight and measurements.

Carriage.—In comparison with other ducks, the body is more tightly feathered and appears longer and thinner, and this impression is heightened by the remarkable erect carriage and the fact that the bird when on the alert carries its neck and body almost in a line at an angle of from 50 to 70 degrees to the horizon. Its gait is peculiar in that it travels with a straight-out run and does not waddle or roll like the ordinary duck. In general appearance and shape when in motion, it has, not inaptly, been likened to a soda-water bottle set at an angle of 50 to 60 deg., a character which is best seen in a front or semi-front view. When startled, standing at attention, or trained in the show pen, it assumes an almost perpendicular pose or attitude.

Weight.—Drakes, 3½ lb. to 5 lb.; length 26 inches to 32 inches. Ducks; 3 lb. to 4½ lb.; length 24 inches to 28 inches. The above are fair standard weights and lengths, but must count for nothing if not accompanied with type and well-balanced proportions.

There are three varieties—Fawn, Fawn and White, and the White.

THE KHAKI CAMPBELL DUCK.

General Characteristics.

This is a moderately small breed, the body being wide and fairly deep, with slightly upright carriage and finely-shaped head and neck. In the male the bill is green (the darker the better), the head, neck, stern, and wing-bar bronze, and the rest of the body an even shade of

Plate 88.—A Khaki-Campbell Drake.
A Prolific Laying Breed.

PLATE 89.
A flock of Khaki-Campbell Ducks on a Victorian farm.

khaki or dark buff, with dark orange legs and feet. In the female the bill is greenish-black, the plumage being khaki or dark buff all over, with even ground colours while the back and wings are laced with a lighter shade of buff, and the legs are dull orange, both bill and legs being several shades darker than in the drake. Lightish feathers in the wings are allowed, but white bibs are untypical, as are yellow bills. Khaki Campbells are tame and tractable creatures, and prolific layers of white eggs.

Weight—both sexes, 4½ lb.

HOUSING.

The mild climatic conditions in Queensland obviates the necessity for the construction of elaborate or costly houses for the accommodation of ducks. That does not mean that ducks can be herded profitably into any class of a house. Houses should be built similar in design to ordinary poultry-houses, a lean-to building facing north or north-east, open-fronted, with a ventilation space at the top of the back wall. Buildings so constructed will afford the ducks most protection against prevailing winds and rains whilst at the same time the sun's rays penetrate into the house.

Construction.—The building need not be deeper than 5 feet, and the roof could be 6 feet high at the front and 5 feet high at the back, and a ventilation space of 3 inches at the top of the back wall would be satisfactory. In estimating the size of the building, allow 2 square feet of floor space for each duck; thus, a building 10 feet long and 5 feet deep will accommodate twenty-five ducks. The best materials for the construction of duck houses is sawn hardwood and galvanised corrugated iron. Some persons may desire to make use of bush saplings so as to have cheaply constructed buildings; this may be done, but it is essential to have an iron roof. It may be thought that as ducks usually camp out in the open it is unnecessary to have an iron roof, but this is absolutely essential, for one of the most important factors in the housing of ducks is a dry floor.

Floors.—It is essential for the floor of the house to be dry at all times; a damp or wet floor in a duck house may cause many deaths among the flock, while practically the whole flock will receive a check in growth or production. To ensure dry floors, build up the floor at least 4 inches above the level of the surrounding land; also excavate drains on the highest side of the house, so as to carry away storm water. Concrete floors are best, but an earth floor that has been tamped down fairly hard will be satisfactory. To facilitate cleaning, cover the floor with coarse sand or a litter of hay, grass, or straw. The litter will act as a bedding for the ducks. Nests should be provided. These may be placed on the floor against the walls.

BREEDING.

It will be found most profitable to adopt the same breeding season for light-breed ducks as generally adopted for other poultry—namely, June to September. Ducks hatched during these months will commence laying when egg values are high, and continue for about twelve months before moulting. Heavy breeds hatched during June, July, and mid-August, will be more profitable, as they can be marketed in prime condition for the Christmas trade. The breeding of heavy breeds may be

continued throughout the year, providing that a constant supply of cheap suitable foodstuffs is available.

Selection and Mating.—Care must be exercised in the selection of breeding stock. Special attention must be given to type and size. A careful study of the description of the breed is necessary, so as to be able to select birds that are reasonably true to type. Ducks have a tendency to deteriorate very rapidly in size; therefore, it is essential to maintain size of body when selecting breeding birds. In this regard, it is good policy to weigh the birds before placing them in the breeding pen. Defective ducks should not be used for breeding purposes. In mating, the number of females to mate with each male varies with the age of the male, size of run, whether the birds have access to a swimming pool, and the breed. On an average, mate between six and eight females with each light-breed male, and from four to six females with each heavy-breed male. The number of females may be increased if the male is young and very vigorous. Ducks may be safely bred from until they are three or four years old.

PLATE 90.
The proper way of holding a duck.

MANAGEMENT.

Ducks should be kept apart from fowls, as they are greedy feeders and often prevent the fowls from obtaining sufficient food. Their way of feeding is also slightly different. Apart from these factors, ducks make the drinking water unsuitable for poultry. A swimming pool is not a necessity, but where ducks have access to a pool, they keep in better health, their plumage is cleaner, and they are more free from external parasites. In addition, a higher degree of fertility results if breeding birds have access to a swimming pool. As the duck usually lays in the night or early morning, it is necessary to confine them to the run or house until about 9 a.m., otherwise many eggs may be laid in the pool.

Ducks must have a constant supply of clean, cool, fresh water, and when confined during the night water must be supplied. The water

PLATE 91.
A flock of Muscovy Ducks on a creek at Enoggera, Brisbane.

vessels should be deep enough for the duck to submerge its head in the water.

Ducks are naturally clean in their habits, but if confined in a small enclosure not properly drained, filthy conditions will result. Therefore, strict sanitation should be practised.

When kept in large numbers, ducks, particularly Indian Runners, are very excitable and easily frightened, and if frightened they are very liable to go into a partial moult.

INCUBATION.

It is the usual practice not to set the first batch of eggs laid by a duck, these being often infertile; also, if fertile, weak ducklings usually result from such eggs.

The period of incubation is 28 days for all breeds with the exception of Muscovy eggs. These take 35 days to hatch. The incubation of duck eggs is best done with ducks. If broody hens are used, it will be necessary to sprinkle the eggs with water regularly. Also sprinkle water on the ground close to the nest, for when the hen comes off she will dust-bath, and her feathers will be moistened when she returns to the nest. The duck, however, will moisten her feathers sufficiently before returning to the nest. With artificial incubation, the temperatures should be about 1 degree lower than that for hen eggs—namely, 102 degrees. After setting, the eggs should not be disturbed for 48 hours. After this period they should be turned twice daily, and cooled daily. Each time the eggs are turned, before being returned to the machine they should be sprinkled with warm water. This sprinkling is essential, because the eggs require a lot of moisture. Test, and remove all infertile eggs. Do not open the machine after the ducklings commence chipping until the hatch is complete. Ducklings take longer to break out of the shell than chickens.

REARING.

Ducklings are very hardy, and easy to rear, therefore rearing may be done by artificial methods. Any type of a simple brooder that will permit of water being kept within access of the ducks will prove satisfactory. For instance, a frame with four legs about 6 inches high to which is tacked a piece of hessian from which flannels hang to within an inch of the ground will give results. First place ample straw on the floor, put down the brooder; the ducklings should be kept under the brooder the first day without food or water. To confine them, use inch netting close up all around the brooder. By adopting this practice they will know where to go when feeling cold. The following night they may be allowed 8 or 10 inches around the brooder, and in this space place water vessels. After about a week, it will not be necessary to confine them to the brooder. After about three weeks the brooder may be removed, providing that ample straw is placed in the shed. One important point must not be overlooked, and that is ground draughts must be prevented. Every day the straw should be forked up and, if necessary, replaced with clean, dry straw. Ducklings must not be crowded; best results will be obtained by rearing ducklings in small units. When about four weeks old they may be placed out in houses, for they do not then require much attention apart from plenty of food and water. Ducklings should be protected from the hot sun until

they are well feathered on the head and neck; this is more important with Indian Runners than other breeds. Therefore, the rearing pens should have a number of shade trees growing in them; if not, artificial shade must be provided.

FEEDING.

Ducklings require no food for 48 hours after hatching. During this period they could be supplied with water, coarse sand, and charcoal or wood ashes. A mash that will give good results if fed from the first meal until they are about four weeks old is prepared by mixing together pollard, 10 lb.; maizemeal, 8 lb.; dried buttermilk, 2 lb.; bonemeal, ½ lb.; and fine salt, 2oz. If these ingredients are mixed together the amount for each meal may be moistened as required. If available, 3 lb. of curds would replace the dried buttermilk, thus cheapening the ration. Skim milk is excellent for ducklings; it can be used to moisten the mash, but do not give it in the form of a drink. If there is ample milk available, allow it to curd and strain off the whey, then feed the curds. Imitate nature as far as possible by giving several small meals daily to young ducklings. A little and often is a good motto to adopt. After four weeks of age, they may be fed on a similar ration to the mature ducks. When mature it is only necessary to give them three meals daily, supplying as much food as the ducklings can consume in about half an hour. Be sure they have a big evening meal.

Plate 92.
Ducks should be caught by the neck.

A ration that will give excellent results for the feeding of mature ducks is comprised of the following ingredients:—Pollard, 55 lb.; bran, 25 lb.; maizemeal, 10 lb.; meatmeal, 10 lb.; bonemeal, 1 lb.; and fine salt, 1 lb.; to which may be added 25 per cent. of cooked vegetables or chaffed greenstuff. The salt should be mixed in the liquid first, so as to ensure a thorough incorporation in the mixture. At least two meals should be given daily, but with mature birds a small meal of whole maize may be fed in addition to the mash.

For the fattening of ducks, consideration must be given to the availability of cheap foodstuffs, which are often obtainable in the form of potatoes, pumpkins, and other vegetables; these should be boiled and

may be added to the mash upwards to 40 per cent. of the bulk. Chaffed greenstuff should be included, but do not use much greenstuff when making use of a large proportion of other cheap foodstuffs, otherwise the mash may be too bulky.

Always keep a supply of shell grit and coarse sand in receptacles before the birds.

WATER.

Water is one of the biggest factors in successful duck-keeping; they must always have access to ample clean, cool, fresh drinking water. The water vessels or pool should be sufficiently deep to permit the ducks to submerge their heads. The water vessel should be kept under a shade tree or protected from the sun by providing artificial shade. In rearing ducklings, it is a good plan to put a number of stones in the water vessels; this prevents the ducklings swimming and wasting the water.

Water vessels should be constructed so the ducklings can get out easily in the event of their swimming in the vessels, otherwise they may drown through cramp. This cramping is more likely to occur during cold weather.

COMMON TROUBLES.

As stated previously, ducklings are hardy and easily reared, but losses will occur if they are neglected. The most common troubles are chills and staggers.

Chills.—Symptoms—Watery eyes and nostrils. Cause—Wet or damp sleeping quarters.

Remedy—Keeping the floors dry is the most important point. The drinking water may be slightly coloured with permanganate of potash, and changed several times daily.

Staggers.—Symptoms—Ducklings stagger about and fall on their backs before dying. Cause—Lack of water. When water is supplied after there has been a shortage, the ducklings gorge themselves, bringing about this condition.

Remedy—Keep a constant supply of drinking water before the ducklings.

WHEN SENDING SPECIMENS—NOTICE TO READERS.

With every mail numbers of letters are received from readers requiring advice on matters affecting their crops, stock, &c. Many of these letters are accompanied by specimens about which information is desired. Much trouble would be saved if the sender of each package clearly marked his name and address on the outside. Often the only means of identifying specimens is by a comparison of the handwriting on the address with that on the letters received. Letters should not be enclosed in packages, nor should packages be sealed in such a way as to prevent examination by the postal authorities, for in such cases postage is charged at the letter rate of 2d. per ounce, and the Department of Agriculture and Stock has to pay double the deficiency.

Flocks and Fleeces.

By J. CAREW, Senior Instructor in Sheep and Wool.*

WITH the sheep and wool industry is wrapped up the progress and prosperity of Queensland. Vast tracts of our Central and Western territories are so well adapted naturally for depasturing sheep that the highest quality of merino wool is produced on country where the range of regional rainfall is only from 12 to 20 inches annually, and with no other land improvements than water provision and fencing. In this country, and under the conditions prevailing, the Merino finds its home, and it is the wonderful adaptability of the breed to its territorial environment that has made it the most important factor in the economy of the State.

Where sheep are to be run on grass alone, under the conditions that prevail in our far inland areas, this breed has no superior and we cannot do better than foster its improvement and increase its numbers.

Queensland merino wool has earned a great reputation for the general quality and fineness of its fibre; and, as it fulfils all the requirements of a constant and strengthening market demand, every endeavour should be made to eliminate any coarseness of type not characteristic of the pure Merino. Other countries can produce breeds other than the Merino and that carry coarse wools. It would be to our advantage to avoid competition in wool production in these types, especially in our Central and Western areas. Where sheep are associated with agriculture, the Merino can also be utilised, but in a different way and to a more limited extent. In every country where sheep have been introduced it has been found that some breeds thrive and do better than others. In caring for the breeds that had done best, they were found to develop under the change of environment special characteristics either in type, conformation, constitution, or covering.

British Breeds and Crosses.

The most interesting instances of improvement in breeds and types may be observed in the British Isles where about thirty breeds have been evolved. Each breed is distinct in formation, size, and character; as well as in the length and colour and quality of its wool. Very few distinct breeds were first introduced into Britain, but by crossing to suit special environmental conditions and sticking to the type evolved they developed a set breed. By careful selection, these breeds have been maintained true to type for years. They are chiefly associated with agriculture and adapt themselves more successfully to cultivated crops than the Merino. Many of the British breeds have been introduced into Australia, and those which have done best have also been brought into Queensland chiefly for crossing with the Merino. In this respect they have been very successful, but we shall have to continue introducing them unless studs are started here.

As the Central and West is suitable for breeding the Merino, so is the Darling Downs and similar areas suitable for breeding both the English long-wools and Downs breeds. The chief points leading to success if the sheep are kept under congenial conditions are that they are kept in good health and properly fed. This is a matter requiring forethought and judgment. Where the annual average rainfall is between

* In a broadcast from Radio Station 4QG.

20 and 30 inches, it should be possible to grow a fair quantity of fodder crops for fattening purposes and for conservation. Under these conditions these English breeds can be reared successfully and studs established. Only sufficient stud flocks would be kept to replace the wastage in the sires required. All the drop not selected for this purpose could be disposed of as lambs for home consumption or export. There would be no necessity or advantage in taking any of the strains of the British breeds back into the merino country. In present circumstances, the expansion in production of many crops that can be grown successfully on the Downs, and closer in to the coast, cannot be done profitably unless a greater number of stock are raised and sold on the hoof.

I consider that the greatest opportunity for agricultural expansion is offered in the breeding and fattening of lambs for export. For this purpose, the whole of the progeny of all Downs crosses could be sold at about four and a-half months. The Downs breeds will cross well with the Merino, but in this respect the best results could be expected by using the stronger type of plain-bodied ewes. Where the English long-woolled rams are used, all the ewe progeny could be retained for breeding purposes. The Lincoln, Border Leicester, and Romney Marsh have already proved themselves satisfactory for this purpose in Queensland. The less Merino and more Romney Marsh near the coast will be the strain to suit the conditions. Further inland, and for higher and better-drained conditions, the Lincoln and Border Leicester, especially the latter, is to be preferred.

The progeny of the long wools are not as quick to mature and fatten as the Downs crosses, the Border Leicester excepted.

The Farmer's Breeding Flock.

The ideal type of farmer's breeding flock is a quarter-bred long-wool three-quarter-bred Merino. This type is strong and robust, well adapted to stand adversity, and make a good recovery; and they can be mated both in autumn and spring. Their wool is usually of a good, desirable type, an important point in a flock that has to be maintained from year to year. If the breeding flock is retained for about five years, they should then fatten successfully. It is far more profitable to fatten the breeders off before they become too old, for it is among aged sheep that heavy losses occur.

All countries have their seasonal difficulties, and Queensland is no exception. There are periods when little or no provision, other than that provided by nature, is necessary; and this is, to some extent, responsible for the lack of provision by most of our sheep farmers.

Successful fat-lamb production must follow the plough. Fortunately for us, we can produce successfully in normal seasons both summer and winter crops in all districts suitable for the English breeds of sheep and their crosses. Health is another matter of great importance, but fortunately we have no parasite or disease here but what can be successfully dealt with. The ordinary stomach worm is the one parasite in our agricultural areas that causes the greatest amount of trouble, and these are extending well out to the West.

Drenching and Dipping.

Too much care cannot be exercised when introducing sheep on to a holding, and if there is any suspicion of worms they should be drenched twice at intervals of eight days.

In recent years lung worms have been causing considerable trouble, especially in the southern part of the Darling Downs. The introduction of stud sheep from lung worm areas in the South is, to a great extent, responsible for this spread, for very few store sheep cross the border. Chiefly because of the probable introduction of parasites and diseases with imported stock, I advocate the establishment of a small stud by the farmers themselves. The blowfly is a pest that causes enormous losses to the pastoral industry every year, and the sheep that carry other parasites are more prone to fly attack than healthy sheep. Sheep lice and ticks are parasites that also cause considerable irritation to the sheep, and consequent loss of flesh and wool. By drenching with suitable drenches for the ordinary stomach worms a big protection is given to the sheep against lung, tape, and nodule worms, besides improving the health of the flock, which enables them to resist the attack to a far greater extent.

By dipping all sheep in a good, reliable dip about six weeks after shearing, both lice and ticks are practically controlled for the year. A second dipping will be necessary if a liquid dip is used. Where arsenic is incorporated in the dipping mixture, a considerable benefit will be derived as a protection against the blowfly. If flies are prevalent at the time of dipping, large numbers will be destroyed. If rain occurs within a few weeks after dipping, the flies generally get busy on the damp wool, with the result that more of them will be destroyed. In fact, dipping pays the sheep farmer well where the need exists for protecting his flock against pests and diseases.

Scouring the Clip.

There are many systems of treating wool in the scouring process. Different makes of machines are procurable, but their use is out of the question when only small lots are to be treated.

The potsticks have been superseded by the wool-washing boxes. The latter requires a plentiful supply of water, which should enter in such a way as to keep the wool open and slowly revolving without becoming ropey. These boxes are made of wood, and big enough—about 3 feet square—to allow a man to reach all parts comfortably. Inside this box is a close wire or perforated zinc tray made to prevent the loss of small locks during the scouring process. A space of from 2 to 3 inches is allowed between these two boxes for the free passage of water. The outer wooden box is fitted with a valve for quick drainage. The water is supplied from an overhead tank and enters the box at the bottom, which keeps the wool open while the box is in use. For convenient working there should be two soak tanks and two washing boxes to be used alternatively. The two washing boxes are then filled with wool from the first soak tank. Between the two washing boxes should be a draining board sufficiently large to take the wool from one washing box. The wool is allowed to drain while the second box is washed and the first box refilled. This drained wool should be put into a centrifugal or hydro-extractor, for the sooner the wool is freed from water the better the colour. This outfit requires capital and a plentiful supply of water; so where small lots are to be treated tubs may be used both for soaking and washing.

The ordinary common bar soap will be found suitable to put in the soak tank, 1 lb. to 300 lb. of wool, which can be soaked in 200 gallons of water, or in like proportion. Caustic soda should not be used in scouring

wool, but marseil caustic soda soap is quite safe. This can be made according to directions on the containers, but the larger the quantity the longer it will require to be stirred. The fat should be stirred well to ensure that it is all melted, and then allowed to cool down to lukewarm, or to when it commences to harden on the sides, before adding the caustic lye. After mixing into bars it requires at least six weeks to mature. To prepare it for use, dissolve 1 lb. of soap in 2 gallons of water by boiling, and use as required to make the liquor the desired strength. The water in the soak tank should be from 100 deg. Fahr. to 120 deg. The wool should remain in soak for at least half an hour. Vary the quantity of soap and the temperature of the soak liquor according to the nature of the wool. Dusty wools require more soap, less heat, and longer soaking than ordinary heavy-conditioned wools, such as locks and stained pieces.

Without the centrifugal, wool should be allowed about ten minutes to drain, then pressed to squeeze out all surplus water and immediately spread on hessian sheets 8 feet by 6 feet and left in the sun to dry. Treatment during drying is important, as all lumpy wool will dry a dull colour. To avoid this, hold the wool to the body with one hand and tease out in small handfuls with the other while turning it. While on these sheets the wool should be turned and teased out twice a day. When thoroughly dried, roll it up in the sheet on which it is spread and stack for a few days in a heap under cover. This allows the wool to become uniform in condition throughout.

Before scouring, the wool should be sorted into classes as even as desired to secure a product even in quality, length, colour, and condition. Belly wool, stains, and locks should be kept separate.

QUEENSLAND SHOW DATES, 1934.

August.

Royal National, 6th to 11th
Home Hill, 31st August and 1st September

September.

Enoggera, 1st
Imbil, 7th and 8th
Ingham, 7th and 8th
Pomona, 12th and 13th
Innisfail, 14th and 15th
Mareeba, 20th and 21st
Beenleigh, 20th and 21st
Rocklea, 22nd
Malanda, 26th and 27th
Kenilworth, 29th

October.

Southport, 5th
Millaa Millaa, 5th and 6th
Tully, 12th and 13th

Part I.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

The Large White.

ORIGINATING in Yorkshire, England, and formerly known as the Large Yorkshire, the Large White, one of the best known of British breeds of pigs, has, in recent years, gained world-wide fame and popularity, and is now the most widely distributed of all pure breeds. Its history is full of interest, for it was one of the first of the breeds claiming origin in the United Kingdom to be developed and popularised, although in those early days it was not of the same excellent type and conformation as at present, nor did it carry the same breed designation.

Breeders not only persisted in their efforts to improve and commercialise the new breed, but at considerable expense to themselves exhibited at live-stock fairs and village stock shows. In this and many other ways they brought under the notice of farmers of the Homeland their importance as an influence in the breeding of a better type of animal. Progress in such work was necessarily slow and difficult.

For many years, particularly in Australia, this breed appeared to lose favour. The Large White has now regained its popularity, and has proved its adaptability and suitability to such an extent that it now holds pride of place in the pig world; and is represented in official herd books by a greater number of registrations than any other known breed, British or American.

Breed Characteristics.

The Large White is one of the largest of the British breeds of pigs, its long and abundant coat of white hair on a white or pinkish-coloured skin being characteristic, the pinkish-coloured skin indicating breeding and quality, while freedom from blue or dark spots on the skin is an important point. It would not be correct to say that the presence of one or two of these blemishes on the skin is an indication of lack of quality or purity in the breeding, for wherever white-skinned pigs are bred there is a tendency for blue or dark-coloured spots to appear, more particularly above the eyes or in the vicinity of the ears, with an occasional spot on the back or rump.

It is to the credit of the Large White that it has frequently been successful in winning bacon pig and bacon carcass contests throughout the world; that it is invaluable for crossing and is recognised especially for this characteristic. It is a recognised sire for imparting quality to stock which lack this very necessary qualification: it is excellent for bacon production, more particularly where crossed with blocky or thickset stock; it matures quickly and to advantage, and is recommended by curers and butchers, especially by those who are more conversant with the virtues of this type and its crosses with other breeds. It is universally recognised for all these qualifications and, while able to satisfy the varied requirements of the general agriculturalist in this and other countries, it is especially adapted for use in commercial pig farming under the open-air system, so desirable wherever pigs are kept in numbers sufficient to justify the outlay necessary in providing additional outdoor accommodation.

PLATE 93.

Large White Boar of approved type as recommended for use in the breeding of bacon pigs suited for local and export trade. Note sturdy appearance of this well-known sire.

The breed is exceptionally prepotent, in fact, both this and the Middle White have this desirable characteristic to a marked degree, and wherever the white breeds are used the bulk, if not all, of the progeny will be white in colour, and very true to type. Prepotency has been defined as the power one parent has over another in transmitting its qualities and breed characteristics to the offspring; thus the Large White as a sire transmits his qualities, type, and colour to a very marked degree when crossed with a blocky thick-set sow of, say, the Berkshire type. In its turn, the Berkshire, also a prepotent breed, gives a compactness and desirable conformation to the progeny, but fails to transmit its colour, because in that respect the white breeds carry a greater degree of prepotency. The reverse holds good also, for when the Berkshire boar is crossed with the Large or Middle White sow the majority of the progeny will be white in colour, though perhaps showing more of the Berkshire type than where the white pig is used as a sire.

Another desirable characteristic of the Large White is that of fecundity or prolificacy. It is not only an advantage to the farmer that his stock should breed freely and regularly, but that they should also reproduce themselves abundantly.

Fecundity as a breed characteristic and, particularly in the Large White, runs in families; hence within the breed there are many families more prolific and more desirable than others, although the latter may be true to type, colour, and general conformation. It is noticeable, too, that although the degree of fecundity in live stock is, to a very large extent, influenced by the feeding and conditions under which the animals are kept, this breed appears to maintain its prolificacy under almost every condition, although, as will be understood, there is a very much higher infant mortality where the stock are neglected than where they are given proper housing accommodation and attention.

It has been noted by those who have devoted time to careful research to these problems that the breeding powers of animals are most energetic when the animals are in moderate condition, uninfluenced either by extreme fatness or the reverse; hence, as the Large White breed is one that maintains itself in moderate condition and does not tend to run to fat, it is more fecund or prolific than those breeds inclined to fatness and of more blocky stature.

In the Farrowing Returns for 1932 published in the Herd Books of the National Pig Breeders' Association of Great Britain, it will be noted the feature of prolificacy is most pronounced, while the capacity to suckle and rear their families compares more than favourably with other breeds.

N.P.B.A. Farrowing Returns, 1932.

SUMMARY.

Breed.	Number of Litters Notified.	Average Pigs Born per Litter.	Average Pigs Reared per Litter.
Berkshire	382	8·46	6·87
Large White	5,713	10·32	7·86
Middle White	1,638	9·55	7·57
Tamworth	129	8·28	6·19
Wessex Saddleback	727	9·62	8·12

This shows that, of 5,713 litters notified, the average pigs born per litter, 10·32, was the highest of the five breeds of whom particulars are recorded by the N.P.B.A., and that the infant mortality was little or no higher in this than in any of the other breeds, the exception being the Wessex Saddleback, who, over several years, have recorded the highest percentage reared of pigs farrowed.

The breeder wants boars and sows that are prolific and ready breeders, whose litters are not only large, but in which each pig is a strong and quick grower. They must be of a firmly established type so that a litter shows uniformity in all points.

PLATE 94.

Large White Boar, "Creek Bradbury 9th," a prominent prize winner at British Shows. Note light forequarter, long, lean body, and shapely conformation.

It is noticeable that big breeds of pigs are invariably more prolific than small breeds, although big breeds need more attention, and the returns they give are dependent almost entirely on the care given in

PLATE 95.

Large White Sow, "Spalding Belle 41st," bred and exhibited by Mr. Alfred W. White, of the Spalding Herd, Spalding, England. A neat, attractive sow, showing light, neat forequarter, roomy body, and well-developed hindquarters.

feeding and management. A prolific sow is of great value to any farmer. Recently a pure-bred Large White sow in England bred and reared fifty-five pigs in five litters, and later farrowed her sixth litter of twenty-one live pigs. Another prominent Large White breeder there who keeps strict records, shows that in 1933, thirty-three farrowings produced 378 pigs, and an average of 11·45 per litter. Of this number 305 were weaned, an average of 9·24. Thus 80 per cent. of the pigs born were reared.

Plate 96.

Group of Large White pigs, who put up a good record in the Minnesota Record of Performance Test, U.S.A. Average daily gain in weight over period of test, 1.40 lb. Total foods per lb. live weight increase, 3.42 lb. Good growers of desirable conformation.

The Queensland record for a Large White appears to be held by Kingston Patricia 1346, a well-known prize-winning sow. She has had six litters—of 11, 15, 15, 15, 15, 15. She had her sixth litter before three years of age, and at that time was still in a productive profitable condition.

The Large White as a Baconer.

The suitability of any breed or cross for pork or bacon factory requirements is dependent almost as much on feeding and management as on breeding, although it is virtually impossible to make a bad pig a profitable one. The long lean side of the Large White is the feature that appeals to bacon curers; in addition, the fore quarter is light and fleshy while the ham is reasonably proportioned and can be improved upon by judicious crossing with breeds whose hams show more cushion and thickness. Desirable crosses include the Large White boar on Middle White or Berkshire sow, or on selected grade sows showing similar type.

For Queensland bacon markets, it is desirable that this system of crossing be followed, for if the Large White is crossed with the Tamworth, it is most difficult to finish the pigs for factory requirements within the weights required. For the export markets these more growthy, larger-framed pigs can be matured to advantage, but it is useless attempting to mature such pigs as porkers or lightweight baconers except at an expense in feeding that is not warranted.

Selection of Boar and Sow.

In the selection of boar or sow, special attention must be given to securing animals possessing a sturdy constitution, a quality denoted by a wide, deep, capacious chest, width between the eyes and ears, strong, straight forelegs wide apart and set well on the outside of the body. No tendency to inbent or weak knees should be allowed. The shoulders must be light, back long and straight with well-sprung ribs, roomy barrel and deep sides, hams thick and compact in comparison with size of animal, tail well set upon the rump. Both boar and sow should show twelve to fourteen or sixteen well-developed teats, with a deep level underline. Flanks must be deep and loose. The coat of hair must be thick, straight, and silky. A tendency to curly coat often indicates coarseness and, like short stubby hair, is undesirable. The head must be well developed, not too large and ungainly, but neat and attractive, the

Plate 97.—Lockwith Blackberry, 8th.
A championship prize-winning sow at British Shows. A matron of superior quality.

face slightly dished, the snout of medium length and somewhat pointed, the muzzle broad, eyes bright and kindly, the jowl light and running well into the neck. The ears should be of medium size and but slightly inclined forward and fringed with fine silky hair. The boar's breeding organs must be well developed—no sign of rupture or of abnormal swellings being allowed to pass without critical inspection. Never use a boar showing any weakness in this respect, as any weakness would probably be of an hereditary nature; look for quality both in flesh, skin, and hair, and rigorously cull any stock not coming up to the standard.

It is only families that are prepotent, prolific, vigorous, and contented that should find a place in the herd. Heavy shouldered, thick-set types are most objectionable in these long-bodied breeds, and invariably lack the powers of prolificacy and quick growth without which the Large White would soon prove unsuitable.

Litter Weight Performance.

Claimed as an Australian record for a Large White sow's production record the sow, "Vaucluse Jewel 5th," 840, has put up a record difficult to excel. Her pigs were produced and handled under official control, the figures being certified to by Victorian Government officials. The sow herself is a prominent prize winner, and is of a very prolific and productive type. She is registered and was bred in Victoria and a large number of stud stock have been selected from her litters, whose records are as follows:—

Litter Weights at Twenty-six Weeks of Age from Sow, "Vaucluse Jewel 5th."

1st litter, total weight at 26 weeks	2,400 lb.
2nd litter, total weight at 26 weeks	2,506 lb.
3rd litter, total weight at 26 weeks	2,375 lb.
4th litter, total weight at 26 weeks	3,187 lb.

or a total litter weight (reared to 26 weeks each litter) of 10,468 lb. within two years.

Plate 98.—Wall Beautiful 11th, 191626.

Supreme championship winner in Large White breed, Royal Agricultural Show, England, 1932. A wonderful sow in every way. Note her capacity to rear and suckle and her well-developed hindquarters.

Records such as these indicate what can be done by efficient feeding and control of a type of stock capable of quick and economical growth. It is well to remember, however, that such records cannot be expected in the absence of a sound knowledge of the business of pig-feeding and an understanding of the qualifications of the type of pig handled.

The Federal Council of the Australian Stud Pig Breeders' Society has adopted the following "Standard of Excellence" and Scale of Points for Large Whites:—

	Points.
Head and Ears.—Moderately long; face slightly dished, not too much turned up, wide between ears; jowl not heavy; ears long, thin, slightly inclined forward, and fringed with fine hair	15
Neck and Shoulders.—Long and full to shoulders, deep to chest; shoulders level across top, not wide, free from coarseness ..	10
Back and Sides.—Long, level, and wide from neck to rump; loin broad; ribs well sprung; sides deep, well let down to flank, with straight underline; and, in sows, twelve good evenly-placed teats	20
Hams.—Broad, full, and deep to hocks; tail set high, stout and long, but not coarse, with tassel of fine hair	20
Legs and Feet.—Straight and well set, level with outside of body, with flat bone; pasterns short and springy, with feet strong, even, and wide	15
Colour, Skin, and Hair.—Hair white, free from black hair, and as far as possible free from blue spots on skin; skin fine, free from wrinkles; hair long and moderately fine	10
Character.—A combination of all the points showing distinctive breeding, type, and quality	10
Total points allowed	100

CATTLE FEED RACK.

Here is a sketch of a cattle feeder which will hold a fair amount, and keep the animals in comfort during cold winter nights, without waste of fodder. Figure 1 is designed of sawn timber. The frame is 6 feet wide, 6 feet high, and 8 feet long, built on runners to be easily moved about the yard. The pickets are 6 feet long, so that they project 18 inches to 20 inches above the top of the frame. The picket frame is open at the bottom about 18 inches, to let the hay down on to the A-shaped elevated divider in the centre of the floor, which helps to distribute it within reach of the calves. The tight floor is boarded round with a rim of 4 by 2 to prevent waste of the finer particles of grass, hay, or lucerne hay. It may be boarded up higher to

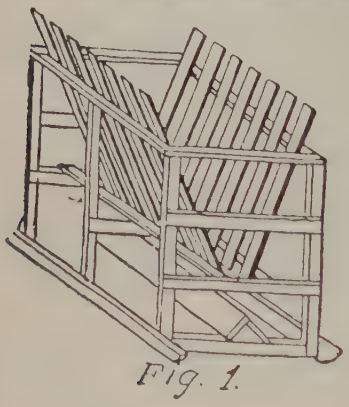


Fig. 1.

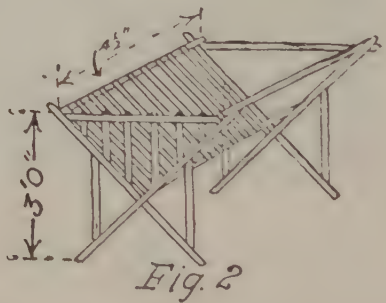


Fig. 2

Plate 99.

make of the lower floor a feeding trough for grain or silage. Should a cover be thought necessary, the end post may be made higher to carry the roof, the hay being then filled in through the gable ends. If the present top bar on the end posts were made to swing it would facilitate filling the rack. Figure 2 shows a feed rack of a bush type for feeding lucerne, &c., to sheep. It is 6 feet long, 3 feet high to the top bar, and the slats are 4½ inches apart. In the sketch, for the sake of clearness, the open sparwork is shown only on one side and one end. Some dairy farmers do not like the overhead racks, and might prefer the bush rack even for cows.

The Problem of Youth.

ST. LUCIA FARM SCHOOL.

By J. F. F. REID.

NO nation can afford to allow a generation to grow up in idleness. So priceless a heritage is the right to work for an independent living and for personal liberty that it is worth every sacrifice we can make for the full-time employment of the mind and muscle of our youth—Australia's manhood of to-morrow.

PLATE 100.—A POPULAR RENDEZVOUS.
The Dining Hall muster for the midday meal. The St. Lucia menu is, probably, unexcelled at any other boarding school in Queensland.

A realisation of those facts was the force behind the establishment of the St. Lucia Farm School, and is still the impelling force behind further efforts of the Departments of Agriculture and Stock, of Labour and Industry, and of Public Instruction. Co-operating with the Government in its search for a solution, in part at least, of the biggest problem confronting the nation—the problem of unemployed youth—are the Churches, the New Settlers' League, the Legacy Club, the Rotary Club, and other social organisations.

The Story of St. Lucia.

Two years ago a conference of representatives of the Departments and social organisations named was convened by Mr. Frank W. Bulcock, Minister for Agriculture and Stock. At that conference Mr. Bulcock outlined a project for the establishment of a farm training school at a place convenient to the city, at which boys with no immediate prospect of absorption in industry, and without previous rural experience, might be trained for a life on the land. Addressing the conference, the Minister said, *inter alia*, that there were many reasons why a State must engage in an active "young man's land movement" under proper conditions.

PLATE 101.—GROUP OF TRAINEES, ST. LUCIA FARM SCHOOL.

Seated in the centre of the front row (left to right) are Messrs. A. J. Bowman (Farm Foreman) and F. Skinner (Queensland Agricultural College). The Supervisor, Mr. J. A. Kerr, was absent at Moggill with a large party of boys who are undergoing a course in practical bushcraft, when the photograph was taken.

PLATE 102.—A GENERAL VIEW OF THE ST. LUCIA FARM SCHOOL BUILDINGS.
From left to right—The Dining Hall, Cook's Cottage, Office, Store, Staff and Trainees' Quarters (centre), Poultry House, Hay and Milking Sheds.

Plate 103.—Points of a Good "Poddy."
A Dairy Instructor demonstrating at St. Lucia Farm School.

Plate 104.—A Riverside Rural Scene at St. Lucia.
Fodder cultivation and conservation is practised as well as preached at the Farm School.

First, if they agreed that the limits of production had been reached, then there was no hope in the future for Queensland, in common with Australia generally. They could not escape their agricultural destiny, and therefore must wisely direct it. Wise direction must be the very opposite to the policy of despair that was associated with restriction of land settlement. Rather must they continue to produce with skill and distribute with wisdom. Queensland was a primary producing State, and while they were labouring under a cloud of depression it was natural to expect that their primary industries would suffer, but economic surveys had shown that periods of depression alternated with periods of prosperity. One of the great difficulties confronting the statesmen and economists of the world was the regulation of phases of economic interplay and the evolution of a system whereby a general satisfactory

PLATE 105.—GRAZING DOWN THE STUBBLE.

On St. Lucia is a fine herd of thirty dairy cows, grade Jerseys, mainly. Sound dairy management is practised at the Farm School, and this picture shows the cows grazing contentedly on the stubble of an oat crop recently harvested.

average should be obtained. That surely was not beyond the ability of mankind, and agricultural history of recent years had shown distinct evidence of stabilisation. Australia could never agree to a policy of general limitation of production, and he believed that that phase, which was associated so closely with present circumstances, would pass away with the passage of the conditions that had given rise to the advocacy of restriction. The time, therefore, had arrived to prepare for the farming future of the State, and the material to employ was the youth, both of the country and the city.

A survey of immediate prospects could not encourage parents to hope for the speedy employment of their sons in industrial occupations. Queensland had the lands and had the adaptable youth, but the difficulty of bringing both together was difficult of adjustment. He believed it rested particularly in an appreciation on the part of the parents of the merits of an agricultural career for their sons, the promotion of a land

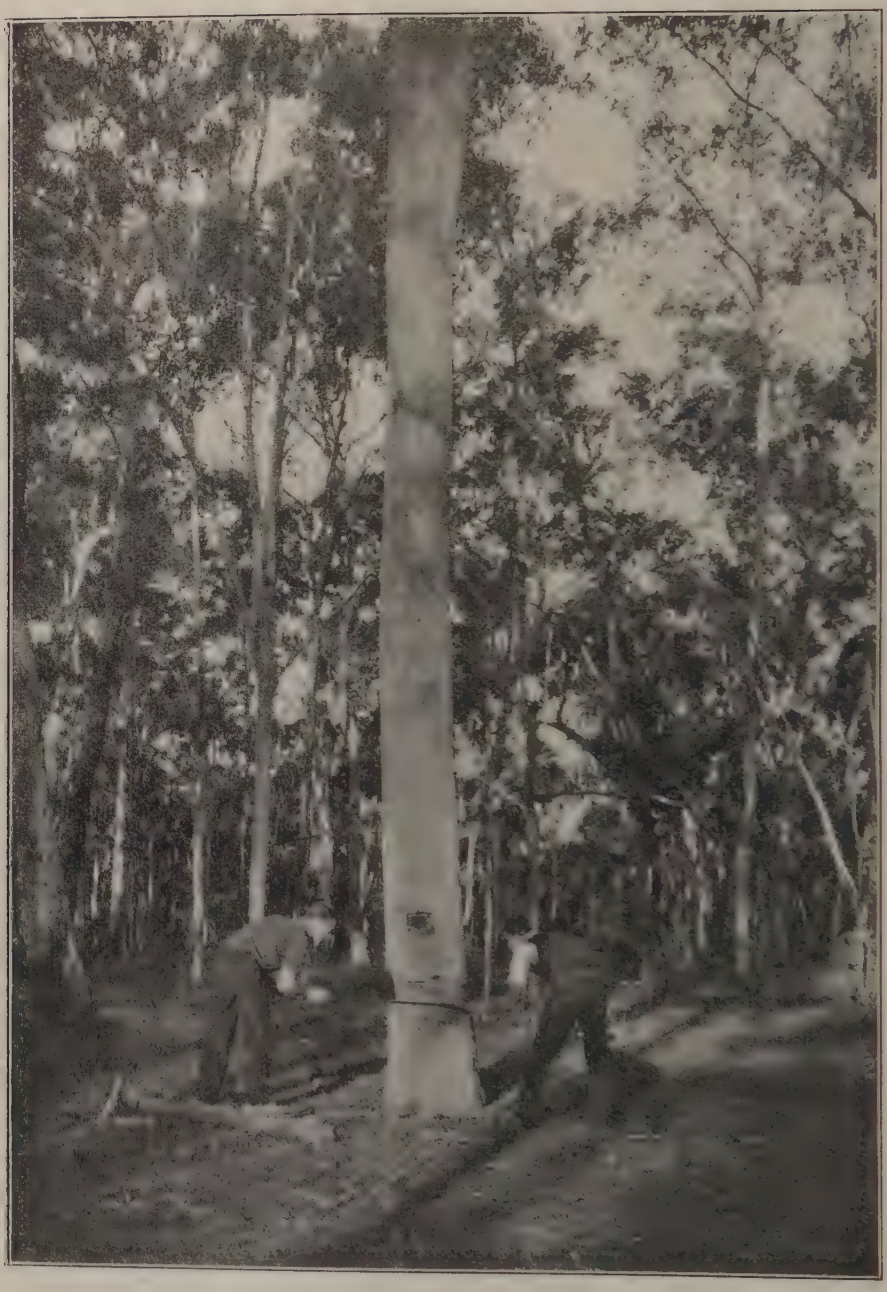


PLATE 106.—SAWING THE BACK CUT.

St. Lucia Trainees are taught various branches of bushcraft in the Queensland University forest lands at Moggill.

PLATE 107.—STAND CLEAR FOR THE CRASH!
The falling tree was belly-scarfed and sawn by St. Lucia Farm Trainees in 7¼ minutes.

PLATE 108.—BARKING THE FALLEN LOG.
Preparatory to sawing it into fence-post lengths.

PLATE 109.—ENTERING A WEDGE.
St. Lucia Trainees engaged in splitting fencing timber.

consciousness in the city youth, and a recognition of the channels through which a boy should pass in order to become a farmer.

Mr. Bulcock then sketched the project he had in mind for the establishment of a farm training school at which, under pioneer conditions, boys who were unable to obtain regular employment, and who were likely to develop landmindedness, might undergo a rudimentary course in agriculture and so qualify for employment in rural pursuits.

Plate 110.—Poultry House and Pens at St. Lucia.

All buildings and dividing fences were erected with material from the Moggill forest by Trainees as part of their general course of instruction.

The conference commended the project unanimously, and appointed a number of committees to advance it to a concrete stage. The Queensland University offered the use of its lands at St. Lucia and Moggill, which it acquired some years before as a University site through the generous and public spirited gift of Dr. and Miss Mayne. Fifty or sixty years ago this land was under sugar-cane and other crops, and a considerable portion of it consists of fertile river flats, and it is otherwise well adapted for the purpose of a farm training school. As the University is not likely to occupy the area for some years to come, it is the general belief that it could not be put to better immediate use than that of a training ground for potential primary producers.

The four committees appointed—organising, curriculum, admissions, and employment—set to work at once on the details of the scheme, and by the following January the training farm became an accomplished fact. It is significant that it has not been necessary to call the employment committee together since the launching of the scheme, for the demand for youths trained at St. Lucia is far greater than the supply.

A Farm Within A City.

A ten-minute motor run takes one from the heart of the city to the pleasant rural scenes of St. Lucia, situated within a hair-pin bend of the beautiful Brisbane River. There are several ways of approach, and the

most direct is by tram to West End, thence by ferry across the river. The nearest way by road is through the riverside suburb of Toowong, but the most interesting route runs through Taringa along Swann road and the crest of a forested ridge from which magnificent vistas stretch away beyond the Peak Mountains, near Ipswich, to the great mountain masses of the Macpherson Range, discernible in the mist-filmed distance and bordering New South Wales. Northward the outlook takes in the whole of the city proper with its lofty Town Hall tower dominating the lesser spires and domes. Westward, forest-clad spurs rise to the bold escarpment of Mount Cootha and the wooded crests of its parent range. Below is the wide sweep of a pretty reach of the river curving in conformity with its serpentine course. On the further bank and back of it is picturesque Yeronga rising to the hills of Tarragindi, and Dutton Park clinging to the steep slopes that ascend to Dornoch Terrace. The sun-silvered surface of upper river reaches glistens amid fields of emerald enamel, specked with the ruby roofs of bungalowed suburbia. A turn of the road and St. Lucia Farm comes within this view of a city beautiful and its glorious environment.

From the entrance gate a long lane leads to a cluster of farm buildings. Away to the right a football field claims a stretch of level land, and nearer at hand is a well-constructed tennis court. A well-conditioned dairy herd is grazing contentedly on the stubble of an oat crop. Curving round the river bend are fields of lucerne and other fodder crops, contrasting in their intense greenness with the native pasture, frosted yellow. Out on the farm boys are busily ploughing, harrowing, and fencing; from the vegetable garden on the further side of the lagoon the earth-polished blade of a hoe flashes intermittently in the sun.

A Training Farm Established.

St. Lucia Farm School was founded by Mr. Frank W. Bulcock, Minister for Agriculture and Stock, and opened by him on 31st January, 1933. Fifty youths, ranging in age from seventeen to twenty years, all from the Brisbane city area, were enrolled. That enrolment, with occasional additional increases, has remained practically constant ever since. In accordance with the original plan, half the boys were admitted as boarders and half as day trainees. Mr. F. O. Bosworth, B.A., of the staff of the Queensland Agricultural College and High School, from which he was seconded for a term, was the first Officer in Charge. On the completion of his term Mr. Bosworth returned to the College, and Mr. J. A. Kerr, a graduate of that institution, was appointed Supervisor of the Farm School.

The curriculum of the Farm School is planned on broad lines, with the idea of giving the boys a thorough grounding in the rudiments of ordinary farm routine. Instruction is given in all branches of dairy practice, pig raising, poultry keeping, and general farm field work.

The farm contains about 170 acres, consisting of undulating country and fertile river flats. The soil on its arable area is mostly sandy loam with some heavy alluvial patches. It is well adapted for dairying and mixed farming. At present 32 acres are under cultivation, of which 5 acres have been designed as pasture improvement plots for both instructional and experimental purposes. Fodder crops are grown and conserved. English potatoes, sweet potatoes, pumpkins, and arrowroot

PLATE 111.—HIS FIRST LESSON.

There is knack in holding the plough handles, with the risk of a knock on the solar plexus, as the farm learner soon finds out.

[*Photo. by courtesy of the "Telegraph," Brisbane.*

PLATE 112.—A TOUGH TASK.

Cross ploughing new land matted densely with paspalum. The picturesque suburb of Yeronga is on the further river bank.

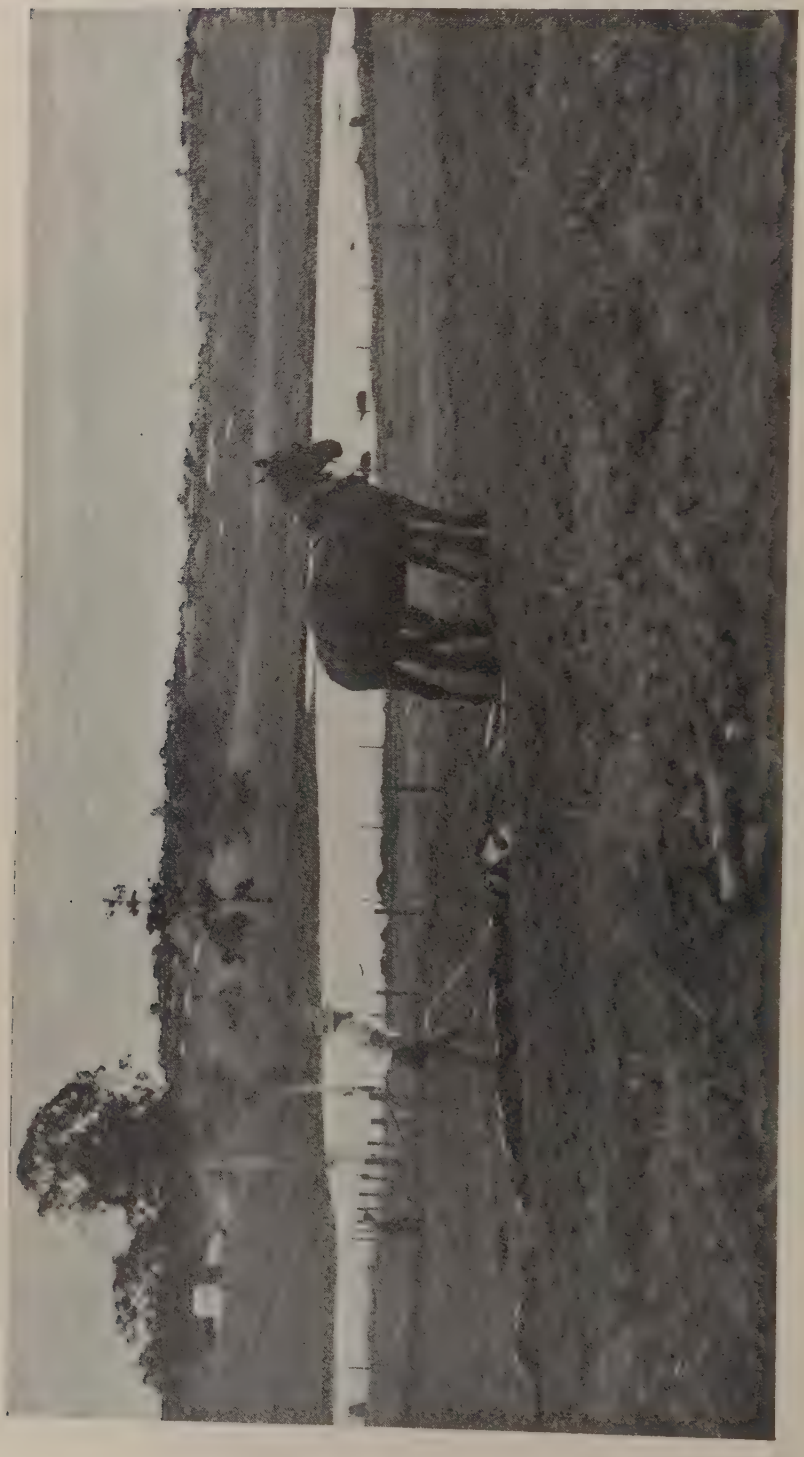


PLATE 113.—OPENING A FRESH FURROW.

The heights in the distance are on the other side of the river at Dutton Park. Wild ducks and other aquatic bird life find sanctuary in the lagoon at St. Lucia.

PLATE 114.—WIELDING THE MAUL.
A temporary stake fence to enclose a fine sward of Italian rye grass (right) on St. Lucia, in course of erection.

are also grown, the lastmentioned being used as pig feed. Irrigation—a spray system—is practised in an extensive and well-cropped vegetable garden. An extensive plantation of Queensland nuts has been established, and within a few years these beautiful and profitable native trees should form a striking feature of the St. Lucia landscape. The farm is practically self-supporting, and in the general dining hall at St. Lucia meals probably unequalled in quality and quantity at any other boarding school are served.

The boys find healthy and interesting recreation on the football ground, tennis courts, and in a reading-room in which a radio set has been installed. Daily and weekly papers are supplied through the courtesy of the management of each of the three Brisbane dailies.

Besides the farm at St. Lucia, there is a tent camp in forest country at Moggill, also University land, to where working parties are taken from time to time for instruction in bush craft and pioneering, including the use of the axe, crosscut saw, and maul and wedges. From this camp is supplied all the fence posts and round building timber required at St. Lucia. Groups of boys are also taken, from time to time, to Beerburrum, where they receive tuition in tobacco cultivation and the curing and grading of tobacco leaf. Accompanied by an instructor, the boys also visit, on occasion, the Roma Street Markets, the Kingston Butter Factory, and a commercial pig farm in its neighbourhood. Field officers of the Department of Agriculture and Stock visit the farm, as required, to lecture on dairying, pig raising, poultry keeping, agriculture, fruit and vegetable growing, chemistry of the soil, botany, entomology, and plant pathology.

Piggeries, portable and permanent, have been built by the trainees on the farm in conformity with the general instructional programme. Brood sows of the Large White, Tamworth, and Berkshire breeds are housed, and litters of pedigreed and crossbred pigs are raised for the purpose of instruction in piggery management.

A fine dairy herd, grade Jerseys, running on the St. Lucia pastures supplies milk and butter to the establishment. Both disc and mouldboard ploughs are used in the cultivation of a large acreage. Standing crops of winter cereals, mangels, maize, lucerne, vegetables, and fine swards of introduced grasses are evidence of the industry of the trainees and the practical nature of the instruction they receive.

At the end of July last year the first group of trainees completed their course in the rudiments of rural industry, and were quickly absorbed in farm employment. Since then the demand for boys trained at St. Lucia has far exceeded the supply. It has been so arranged that every quarter half the personnel of the establishment is available for engagement in country jobs, and the boys are placed immediately. As each group leaves a similar number is enrolled to keep the establishment up to full strength.

Scholarships Awarded.

At the end of every quarter an examination is conducted by officers of the Department of Agriculture and Stock for the purpose of selecting a lad for a free scholarship at the Queensland Agricultural College and High School at Gatton. Five scholarships have already been awarded. The reports of the examiners invariably contain comments on the high standard attained by the candidates. This is not surprising,

Plate 115.—Sighting a Line of Fencing.
Example of practical instruction at St. Lucia Farm School.

Plate 116.—The End of the Swing.
Driving stakes in a temporary fence to enclose a pasture plot.

PLATE 117.—FEEDING THE MORNING MILK TO A HUNGRY LITTER.
Piggery management is part of the curriculum at St. Lucia Farm School. The portable shelter was constructed by the boys from scrapped material found on the farm.

PLATE 118.—PREPARING LAND FOR LUCERNE.
Plough teams in charge of Trainees at St. Lucia.

PLATE 119.—YOUTH AT THE PLOUGH.
Learning to open a straight furrow at St. Lucia Farm School.

PLATE 120.—GIVING THE HORSES A "BLOW."
A scene on St. Lucia. The lad was receiving his first lesson in ploughing and the handling of a team. Mount Coot-tha and D'Aguilar Range in the distance.

Plate 121.—Breaking down the Clods.
Every branch of farm field work is included in the school programme.

Plate 122.—Preparing Land for Another Crop.

Plate 123.—Picking Peas for the Pantry.
St. Lucia Farm School is practically self-supporting in respect of food supplies.

Plate 124.—At the End of a Well-cropped Cabbage Row.

for many of the trainees have passed the State Scholarship Examination and have been educated up to the Junior University grade. The successful candidate is awarded a twelve-months' scholarship at the College at Gatton, and is given the opportunity of gaining an extension of the scholarship for a further term. For the boy who realises, as some of them obviously do, that "The Chance of a Lifetime is only during the Lifetime of the Chance," the extension scholarship may lead on to the Agricultural Faculty of the Queensland University. Thus the gate of opportunity is wide open to the boy who passes through St. Lucia.

Conditions of Enrolment.

Parents who desire that their boys should enter the school should place themselves in touch with the Interviewing Officer (Mr. J. Kilmartin), Department of Agriculture and Stock, William street, Brisbane. Trainees are accepted at any age between fourteen and twenty-one years. The boys pay no fees, and receive free board. Farmers who desire to engage the services of the youths at the end of their training term should communicate with the Lads' Employment Bureau, Box 1448 T., General Post Office, Brisbane. The boys represent a fine type of Australian youth—keenly intelligent, country-conscious, active, energetic, and imbued with an excellent spirit. Their general standard of conduct is high, and the staff has succeeded in establishing a good tone in the farm school, to which the character and calibre of the young trainees responds very readily. Reports from farmers who have St. Lucia trainees in their employ are, invariably, highly appreciative.

The foregoing, briefly, is the story of St. Lucia, which, it is believed, is measuring up to the ideal of its founder and fulfilling the hopes of the interested citizens who support him in what is regarded as an important social movement designed to counter the effects of the existing economic situation—to some extent, at least—by directing the youth-power of the land into fields of primary production. The main idea behind the scheme, the success of which was never doubted and which has already been amply proved, was to give workless city boys an opportunity of training for a country career.

The problem of youth is to find fitting opportunities for youth on the threshold of youth's career. We have suffered the years of economic depression in common with every other country, but the inherited spirit of Australians is such that it would take many more years of deferred hope to damp the ardour of Young Australia. These boys of ours are game and willing. They are ready; they are prepared. Therefore, Queensland must give them their opportunity. There is plenty of room in Australia, there are "potentialities" to absorb the energy of millions. To find in this field the chance for our own young people is the present and most pressing duty of the nation. The farm school at St. Lucia—to which may soon be added similar institutions in other parts of the State—is, at least, some evidence of our acceptance of that duty.

Agricultural Notes.

H. W. BALL, Assistant Experimentalist.

MILD winter conditions continue up to the time of writing throughout the coastal agricultural areas, and following on the good season experienced the usual decline in pastures and consequential dairy production has not been unduly pronounced. Acting in accordance with Departmental advice, an increasing number of farmers are supplementing their reserves of fodder by early and successive sowings of winter crops, such as barley, oats, and wheat, thereby maintaining production and keeping stock in good condition throughout the period of natural scarcity of feed. The sowing of lucerne and winter grasses is also receiving greater attention, and experience thereby being accumulated of those species which are likely to give the best results in the various districts.

PLATE 125.

A FIELD OF "NOVO" WHEAT AT WILLOWVALE, DARLING DOWNS.

"Realisin' he was wealthy in what makes a life worth while."

Wheat.—The outlook for the present season is uncertain, as, owing to dry autumn conditions throughout the chief producing areas, early cultivation was retarded, and this fact, in conjunction with the low price levels prevailing, is likely to result in a reduced acreage being sown. The Dalby district experienced more favourable conditions, many hundreds of acres of new land being sown, and crops in this area are generally in good heart. In the Clifton district it was necessary to feed off the rank growth of early-sown crops after the July rains, whereas in the Warwick district and the Maranoa considerable areas have had to be replanted. From the above remarks it will be noted that the season, to date, has been rather patchy.

Sugar.—With mid-winter conditions prevailing in all cane areas, very little crop growth was recorded for the month of July. No serious frosts have been reported, however, and it is now certain that little damage will be inflicted from this cause, as practically all mills are operating. Fortunately, the absence of heavy rains in the far North has enabled the farmer to push ahead with his land preparation for next year's crop; planting has been unduly delayed in these parts.

The milling returns to date show that the sugar content of the crop is high, in contrast to the low values recorded last year. It is as yet too early to revise the preliminary crop estimates, as much will depend on the growing conditions experienced in the early spring months.

The cane planted prior to the winter has given, in general, satisfactory germinations and the early-planted crop is finding conditions favourable for its development.

PLATE 126.

"THREE SEAS" WHEAT AT FREESTONE, DARLING DOWNS.

"When the sunset sun is gettin' low above the western hills,
When the creepin' shadows deepen, and a peace the whole world fills."

Cotton.—The harvesting of the cotton crop has continued at a good rate during the month, heavy receivals having been experienced at both ginneries. The total amount of seed cotton sent in by the end of July will approximate 23,000,000 lb., which is nearly 28 per cent. greater than the previous record crop for the State. Considerable cotton still remains to be harvested, and it appears likely that the total for the season will be in the neighbourhood of 25,000,000 lb. of seed cotton, which will be obtained from, roughly, 50,000 acres grown by 3,100 growers. The average yield will be a decided improvement over those of the previous three seasons, when such disastrous drought conditions prevailed. Had the entire months of January and March not been dry a much higher average yield per acre would have been

obtained, for, at the end of December, the possibilities were most promising of obtaining exceptionally high yields in most of the districts.

The dry weather following the frosts in mid-June has hastened the opening of the top crop, which will thus allow of the cutting off and burning of the plants in time to start the preparation of the new seed beds in good season. The results obtained in this crop, however, would indicate that it is advisable to plant at least a portion of the cotton area on either newly-brought-in cultivation out of grass land, or following some fodder crop, for apparently a greater factor of safety exists against seasonal variations where cotton is grown on such soils as compared to where cotton has been grown for several seasons in succession.

Plate 127.

"Waratah" Wheat at Yangan, Darling Downs.

"Wheat, Wheat, Wheat! When it comes my turn to meet
Death the Reaper, an' the Keeper of the Judgment Book I greet,
Then I'll face 'em sort o' calmer with the solace of the farmer
That he's fed a million brothers with his Wheat, Wheat, Wheat."

The Director of Cotton Culture advises that planting seed is now being distributed from the Whinstanes and Glenmore ginneries. Before applying for their seed, it is recommended that growers ascertain from the Cotton Section of the Department of Agriculture and Stock, Brisbane, particulars as to the suitability of their soils for growing some of the high lint per cent. medium staple cottons that are being distributed this season. Any inquiries should be accompanied by a full description of the soils on which it is intended to grow cotton, stating whether originally covered with scrub or forest, slopes or alluvials, clay, clay loams or sandy loams, number of years under cultivation, and the name of any variety of cotton that has given good results on the plot or on similar soils in the district.

Maize.—Harvesting of this crop has now been completed. Late-sown maize is very accommodating in this respect, as, given normal weather, it will stand over well into the winter. Although not a record, the returns are over the average, the crop being estimated at 4,500,000 bushels. In the Atherton district a reduced acreage was sown, and the yields also reduced by the excessively wet conditions. The low values being obtained for maize and other grain crops provide an excellent opportunity for stockowners outside the farming areas to purchase stocks which can be stored against the inevitable periods of drought.

Tobacco.—Curing is nearing completion, and grading is being carried out both on farms and grading sheds. Some good-quality leaf has resulted and sales made at satisfactory prices, a choice parcel of northern leaf bringing 4s. per lb. at a recent sale. Although the present season's production has fallen considerably below that of 1933, chiefly owing to the heavy rainfall, growers generally are optimistic, and the experience gained will be of value; so a gradual expansion of the industry on sound lines may be confidently anticipated. In the Mareeba and adjacent districts, peanuts are likely to become a good subsidiary crop for tobacco-growers, as yields of up to a ton per acre of good-quality nuts have been obtained where suitable fertilizers have been used.

Markets.—Fair values have been maintained for primary produce, although lucerne hay, chaff, and protatoes have been in heavy supply. Good-quality potatoes have brought over £11 per ton. At this season a large quantity arrive from the Southern States, particularly for seed purposes, and owing to the condemning of some consignments an exchange of Inspectors under the Diseases in Plants Act with Southern Departments of Agriculture has been suggested, so that an increased knowledge of the market requirements and also greater immunity from introduced disease may be obtained.

All stock are reported to be in good condition and sound values maintained.

Draught horses are in demand and have brought exceptionally high prices at various Downs centres, over £30 being paid for good animals.

A FORMULA FOR WHITEWASH.

Obtain, if possible, large pieces of fresh lump lime, place them in a very large bucket or other suitable container, and into this pour hot water. Cold water will do, but hot water is better, as it hastens the slaking. The lime will start to boil and break up. Keep it covered all the time with about half an inch of water. This is important, for if whilst the lime is slaking it is allowed to rise up above the water in a dry powder it will "curdle," a condition tolerated only by inexperienced and indifferent workmen. Before the lime commences to boil fiercely add tallow or common fat in the proportion of about 7 lb. to 14 lb. of lump lime. This makes a good binder which will prevent the wash from rubbing off. If desired, a little yellow ochre may also be added, which will give a cream or buff tint according to the quantity used. When the lime is thoroughly slaked it should be stirred and sufficient water added to make it a little heavier than, say, milk, after which it should be strained and, if desired, may be applied whilst hot.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 3rd July, 1934, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for July, August, and September, 1934:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 7th August, 1934—"The Packing and Preparation of Tomatoes for Market." By J. H. Gregory, Packing Instructor.

Thursday, 9th August, 1934—"The Avocado in Queensland and Elsewhere." By H. Barnes, Director of Fruit Culture.

Tuesday, 14th August, 1934—"Packing Shed Hygiene." By J. H. Gregory, Packing Instructor.

Thursday, 16th August, 1934—"The Importance of Citrus Bud Selection." By H. Barnes, Director of Fruit Culture.

Tuesday, 21st August, 1934—"Papaw Cultivation." By H. Barnes, Director of Fruit Culture.

Thursday, 23rd August, 1934—"The Pasteurisation of Milk and its Products." By O. St. J. Kent, B.Sc., Analyst.

Tuesday, 28th August, 1934—"Vitamins in Dairy Products." By O. St. J. Kent, B.Sc., Analyst.

Thursday, 30th August, 1934—"Factors Influencing the Amount of Fat in Milk." By O. St. J. Kent, B.Sc., Analyst.

Tuesday, 4th September, 1934—"Seasonal Farm Crops," Part I. By C. J. McKeon, Instructor in Agriculture.

Thursday, 6th September, 1934—"Seasonal Farm Crops," Part II. By C. J. McKeon, Instructor in Agriculture.

Tuesday, 11th September, 1934—"Seasonal Farm Crops," Part III. By C. J. McKeon, Instructor in Agriculture.

Thursday, 13th September, 1934—"The Tobacco Industry Protection Act of 1933." By H. S. Hunter.

Tuesday, 18th September, 1934—"Some Requirements of Plant Growth." By E. H. Gurney, Agricultural Chemist.

Thursday, 20th September, 1934—"Fertilizers and Manures." By E. H. Gurney, Agricultural Chemist.

Tuesday, 25th September, 1934—"Nutritive Value of Pasture." By E. H. Gurney, Agricultural Chemist.

Thursday, 27th September, 1934—"Mineral Ingredients in Stock Foods." By E. H. Gurney, Agricultural Chemist.

CARE OF THE WORKING HORSE.

Most derangements of the digestive organs of horses are due to errors in diet, and a good and regular system of feeding will do more than anything else to prevent trouble of this kind. The following rules for feeding are generally accepted as correct:—

Water before feeding, and not for at least an hour after.

Feed in small quantities, and often.

Do not work hard immediately after a full feed.

Never give a horse food to which it is not accustomed in large quantities.

If these rules are followed, and care taken to ensure that only sound, good food is fed, very little trouble will be experienced.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Ayrshire Cattle Society, production charts for which were compiled for the month of June, 1934 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (over 5 Years Old), Standard 350 Lb.				
Scarlet XII of Springdale	V. Dunstan, Wolvi	12,208·15	583·757	Don of Springdale
Springleigh Primrose	Moller Bros., Boonah	12,924·95	567·101	Kelston Warrior
Queenie 3rd of Glengarry	G. Waugh, Peeramon	12,469·8	477·794	Jambaroo Glengarry
Model XX of Springdale	V. Dunstan, Wolvi	11,356·35	407·877	Lovely's Commodore of Burradale
Junior, 4 Years (under 4½ Years), Standard 310 Lb.				
Happy Valley Bangle 2nd	R. R. Radel, Coalstoun Lakes	7,628·15	330·016	Molly's Hero of Glenthorn
Junior, 3 Years (under 3½ Years), Standard 270 Lb.				
Stella 2nd of Blacklands	A. Pickels, Wondai	9,824·15	362·410	Hugo of Blacklands
Senior, 2 Years (over 2½ Years), Standard 250 Lb.				
Rosenthal Dove 15th	S. Mitchell, Rosenthal	5,651·5	253·116	Rosenthal Reward
Kingsdale Tot 5th	A. A. King, Mooloolah	7,711·1	315·408	Express of Burradale
Junior, 2 Years (under 2½ Years), Standard 230 Lb.				
Mabreen Ivy	V. Dunstan, Wolvi	7,985·45	334·988	Yumbawarra Headlight
Westbrook Bell	W. F. Kajewski, Glencoe	7,592·79	280·162	Sunrise 3rd of Rosenthal
Glenroy Rita	W. F. Kajewski, Glencoe	6,818·23	271·844	Glenroy Kitchener
Westbrook Jinny	F. G. Couper, Westbrook	6,017·96	238·304	Westbrook Ronald
JERSEY.				
Mature Cow (over 5 Years Old), Standard 350 Lb.				
Kelvinside Ideal's Noble Idol (365 days)	J. and R. Williams, Crawford	10,165·65	619·83	Noble of Yaralla

Senior, 4 Years (under 4½ Years), Standard 330 lb.				
Arabula's Pet	J. and R. Williams, Crawford	8,766·25	526·617	Golden Boy
Nan 3rd of Woodlands	D. R. Hutton, Cunningham	8,456·48	373·541	Carnation Golden Duke
Rachel's Gem of Inverlaw	R. J. Crawford, Inverlaw	5,909·15	342·228	Linda 4th Millstream Noble 8th
Junior, 4 Years (under 4½ Years), Standard 310 lb.				
Fauvic Flaremist	H. Cochrane, Kin Kin	6,294·89	319·847	Dreamlad of Glencoe
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Peg of Newhills	J. Nicol Robinson, Maleny	5,256·4	337·95	Newhills Mascot
Senior, 2 Years (over 2½ Years), Standard 250 lb.				
Glenview Sultan's Crystal	F. P. Fowler and Sons, Biggenden	6,089·95	352·812	Caryle Larkspur 2nd Empire
Lady of Wingate	L. A. Pierce, Graceville	7,961·16	341·406	His Majesty of Dalebank
Golden Dewdrop of Golden Hill	Chas. Klaus, Mundubbera	5,389·75	275·452	Wattle Hero of Golden Hill
Lucy of Glenrow	F. Nimmo, Rosewood	6,059·5	267·927	Oxford Nero
Junior 2 Years (under 2½ Years), Standard 230 lb.				
Fauvic Double Joy	H. Cochrane, Kin Kin	5,001	290·204	Condong Double Prometheus
Bellgarth Pansy	D. R. Hutton, Cunningham	5,775·75	288·463	Bellefaire Blonde's Bellringer
Glenview Dainty	F. P. Fowler and Sons, Biggenden	5,118·25	287·021	Caryle Larkspur 2nd Empire
Nimbrae Sylvia	F. Nimmo, Rosewood	6,468	281·97	Oxford Raymond
Faith of Arranmore	J. Newman, Caboolture	4,693·4	254·414	Trinity Prince of Wales
Wyreene Olga	D. R. Hutton, Cunningham	4,256·75	232·29	Goldfinder's Prospect of Morago
Trecarne Silver 2nd	T. A. Petherick, Lockyer	5,832·41	355·346	Trecarne Golden King
Waveley Pretty Lady	L. R. Hutton, Cunningham	6,998·93	334·307	Oxford Gem's Noble 2nd
Glenview Victorious	F. P. Fowler and Sons, Biggenden	5,425	314·488	Trinity Officer
Nimbrae Fanny	F. Nimmo, Rosewood	6,027·5	310·504	Oxford Raymond
AYRSHIRE.				
Senior, 3 Years (over 3½ Years), Standard 290 lb.				
Fairview Lady Bess	R. M. Anderson, Southbrook	12,115·85	451·753	Longland's Bonnie Willie 2nd
Fairview Holly	R. M. Anderson, Southbrook	11,005·93	421·389	Longland's Bonnie Willie 2nd

Land for Grazing Selection.

MALVERN HILLS RESUMPTION.

TWO subdivisions of Malvern Hills resumption, situated from 24 to 36 miles south-westerly from Blackall, will be opened for Grazing Selection at the Land Office, Blackall, on Tuesday, 6th September, 1934.

One block, being portion 1, parish of Maindample, comprises an area of 22,220 acres, and will be opened for Grazing Homestead Selection, with a term of lease of twenty-eight years, at an annual rental of 4d. per acre for the first seven years of the term. This selection will require to be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years, and proof must be furnished of the financial standing and pastoral or land experience of the applicants.

The other block, being portion 3, parish of Granby, comprises an area of 17,745 acres, and will be opened for Grazing Farm Selection for a term of lease of twenty-eight years, at an annual rental of 2¼d. per acre for the first seven years of the term.

Each selection must be enclosed, within three years from the date of the license to occupy, with a fence which is both rabbit-proof and marsupial-proof.

The whole area of the resumption comprises black and brown soil downs country with gidyea forest and scrub.

Portion 1 is sufficiently watered naturally, and portion 3 has a sufficient supply of artificial and natural water.

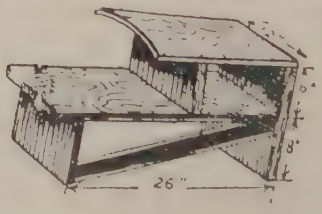
The other improvements consist of fencing.

The improvements on portion 1 are valued provisionally at £1,305, and on portion 3 at £1,425.

Free lithographs and full particulars may be obtained from the Land Agent, Blackall; the Land Settlement Inquiry Office, Brisbane; and the Government Intelligence and Tourist Bureaux, Sydney and Melbourne.

MILKING STOOL.

A stool can be easily made that will do away with holding the pail between the knees, and that will prove to be of a real aid to the milker. About 7 feet of 1 by 12 material will be sufficient; white or soft pine is advised, as it is light and is not



easily splintered. Saw up the material you have selected into the following lengths:—One 26 inches, one 18 inches, one 6 inches, one 8 inches, and the back board 14 inches. One end of the 18-inch board should be shaped to fit the curve of the pail. The stool should be braced to keep it rigid. When the carpentering part of the job is done, paint may be applied to preserve the wood and to make the stool more attractive.

Sugar Levies.

(Abbreviated Notice.)

1934 SEASON.

Regulations under "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1932," have been approved, providing for levies on suppliers of cane to sugar-mills at the following rates for the season 1934 (the figures for 1932 and 1933 are given for comparison purposes) :—

Name of Mill.	General Levy by Queensland Canegrowers' Council.	Administrative Levy by District Executive.	Administrative Levy by Mill Suppliers' Committee.	Special Levy by Mill Suppliers' Committee.	Total Levies for 1934.	Total Levies for 1933, given for comparison.	Total Levies for 1932, given for comparison.
	d.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
Mossman Central	¾	2	..	..	2¾	2¾	3¼
Hambledon	¾	3/8	¼	..	1⅜	1⅜	1¼
Babinda Central	¾	3/8	..	..	1⅛	1⅛	1
Mulgrave Central	¾	3/8	..	..	1⅛	1⅛	1
South Johnstone Central	¾	1½	..	..	2¼	2¼	2¼
Goondi	¾	1½	..	..	2¼	2¼	2¼
Mourilyan	¾	1½	¼	..	2½	2¾	2¼
Tully River Central	¾	1¾	..	..	2½	2½	2¾
Macknade	¾	5/16	5/16	..	1⅜	1⅜	1¼
Victoria	¾	5/16	5/16	..	1⅜	1⅜	1¼
Kalamia	¾	..	½	..	1¼	2¼	1¼
Pioneer	¾	..	1	..	1¾	1¾	1¾
Inkerman	¾	..	½	..	1¼	1½	1¾
Invicta	¾	..	1½	..	2¼	2¼	2¼
Proserpine Central	¾	1	..	..	1¾	2	2
Cattle Creek Central	¾	½	½	..	1¾	1¾	1¾
Plane Creek Central	¾	½	½	..	1¾	1¾	1¾
Marian Central	¾	½	½	¾	2½	2¼	2
North Eton Central	¾	½	½	..	1¾	1¾	1¾
Pleystowe	¾	½	½	½	2¼	2¼	2¼
Racecourse Central	¾	½	½	..	1¾	1¾	1¾
Farleigh	¾	½	½	..	1¾	1¾	1¾
Qunaba	¾	½	¼	..	1½	2¼	1¼
Bingera	¾	½	½	..	1¾	2¼	1½
Fairymead	¾	½	¼	..	1½	2¼	1¼
Gin Gin Central	¾	½	¾	..	2	2⅜	1⅝
Millaquin	¾	½	¼	..	1½	2	1¼
Isis Central	¾	½	¼	..	1½	2	1¼
Maryborough	¾	1	..	..	1¾	2¼	1⅛
Mount Bauple Central	¾	1	..	..	1¾	2¼	1⅛
Moreton Central	¾	¼	1	½	2½	2¼	2¼
Rocky Point	¾	¼	¾	..	1¾	1½	1½
Eagleby	¾	¼	..	..	1	..	..

No poll will be taken in respect of the General Levy of ¾d. per ton (first column) for the Queensland Cane Growers' Council, or for the administrative levies by District Executives or Mill Suppliers' Committees (second and third columns).

In the fourth column, the levies on cane supplied to the Marian Central, Pleystowe, and Moreton Central Mills will be used in defraying the costs of employing farmers' representatives at those mills for the current season. In the case of these levies, growers may petition for a poll, and the petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the cane suppliers to the three mills concerned.

In addition to the foregoing levies, the undermentioned Mill Suppliers' Committees are empowered to make particular levies on growers within each of the following districts, at the following rates :—

Name of Mill Suppliers' Committee and Mill to which Cane is Supplied.	Description of District or Cane on which Levies will be made.	Amount of Levy per ton of Cane Supplied.	Purposes of Levy.
		d.	
Racecourse Central	All cane grown on lands assigned to the Racecourse Central Mill and loaded at the Mount Ossa Railway Siding and supplied to the Racecourse Central Mill	3	To be used for financing a farmers' representative at the Racecourse Mill in the interests of the growers paying such levy.
Isis Central ..	Pialba district within the boundaries of the parishes of Urangan, Vernon, and Bingham, county March	1½	To be used for administrative purposes by Pialba Branch of Isis Central Mill Suppliers' Committee.
Isis Central ..	All cane consigned on the railway from Booyal, Junien, and Marule Sidings on the Dallarnil Railway	½	To be used for administrative purposes by Booyal Branch of Isis Central Mill Suppliers' Committee.
Isis Central ..	All cane delivered in the Cordalba, Huxley, South Isis, North Isis, Childers, Doolbi, and Horton areas.	½	To be used for administrative purposes by Isis Branch of Isis Central Mill Suppliers' Committee.
Mount Bauple Central	Mount Bauple district within the boundaries of the parishes of Gundiah, Tiaro, Gootchie, Curra, and St. Mary	½	To be used for administrative purposes by Mount Bauple Branch of Mount Bauple Mill Suppliers' Committee.
Mount Bauple Central	Yerra district within the boundaries of the parishes of Gungaloon, Denison, Doongul, Woocoo, and Young	½	To be used for administrative purposes by Yerra-Mungar District Branch of Mount Bauple Mill Suppliers' Committee.
Maryborough ..	Pialba district within the boundaries of the parishes of Vernon, Urangan, and Bingham, county March	½	To be used for administrative purposes by Pialba District Branch of Maryborough Mill Suppliers' Committee.
Maryborough ..	Maryborough district within the boundaries of the parishes of Tinana, Maryborough, Bidwell, Elliott, Young, and Walliebum, county March	½	To be used for administrative purposes by Maryborough District Branch of Maryborough Mill Suppliers' Committee.

Growers are given the opportunity of petitioning for a poll to decide whether or not the above levies shall be made. The petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the cane suppliers within any of the areas concerned.

All petitions must reach the under Secretary, Department of Agriculture and Stock, Brisbane, not later than 23rd July, 1934.

Full particulars of these Regulations appear in the *Government Gazette* of the 23rd June, 1934, or may be obtained on application to the managers of the various sugar-mills in Queensland or to the undersigned—

E. GRAHAM, Under Secretary,
Department of Agriculture and Stock,
Brisbane.

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Useful Native Grass (*Echinocloa Colona*).

O.L.H. (Mareeba)—

The specimen of grass has been identified as *Echinochloa colona*, a native grass with a good reputation as a fodder.

Early Spring Grass.

J.L. (Jackson, Q.)—

The specimen is a species of *Eriochloa* or Early Spring Grass. The genus *Eriochloa* is represented in Queensland by several species. It is under review at the present time, and we find it rather hard to give specific names. However, they are all exceptionally good fodder grasses, much relished and readily eaten down by stock, and grow for the most part during the early spring and summer months. It is certainly a valuable grass in the mixed native pasture, but you will have to rely on natural means of spread, as seed is not obtainable through the ordinary commercial channels.

Silky Oak.

E.C.M. (Ingham)—

The common Silky Oak (*Grevillea robusta*) is very easy of propagation and growth, and if you are raising plants on a large scale you would find it much cheaper to raise them from seed than to purchase plants in pots. The seed is very light, but germinates if kept in special beds or flats in light sandy soil and lightly covered with about ¼ inch or a little more of soil. When a few inches high the seedling plants can be pricked off into pots or tubes. In the Queensland Forestry Department galvanised iron tubes are used for most of their planting, the tubes being split on one side and fastened with a clasp. When the young plant has made fair root development the clasp is undone, and the young plant slid into the prepared hole without the roots being disturbed. Chinese market gardeners and others sometimes adopt the same principle with tomato plants in jam tins, the tin being cut down one side and tied with string. Later the string can be cut and the plant transplanted without any disturbance of the root system. Of course, there is no bottom to the tins or tubes. The common Silky Oak is the old Silky Oak of the trade of Southern Queensland and Northern New South Wales. The Silky Oak of the Atherton Tableland and other parts of North Queensland is a totally different tree, most of the timber coming from *Cardwellia sublimus*.. Seedlings can often be picked up in great abundance on the floor of the northern jungles. If you require further information about soil, the distance apart to plant, pruning, &c., to yield the best timber, we would advise you to write to the Secretary, Forestry Sub-department, Department of Public Lands, Brisbane.

Smartweed.

H.C. (Mackay)—

The specimen is *Polygonum minus*, one of the commonest Smartweeds in Queensland. Smartweeds on the whole, so far as we have observed, are more or less neglected by stock. When they are eaten, however, they are said to cause inflammation of the bladder and the digestive tract. Records of poisoning of stock by Smartweeds are very conflicting, and some veterinarians record the fact that they have fed the plants in quite large quantities without any ill effects following. The symptoms as given by you do not suggest poisoning by this plant, and your letter is being referred to the Chief Inspector of Stock for further advice.

Galvanised Burr ; Mintweed.

S.C.L. (Brisbane)—

The Galvanised Burr is botanically known as *Bassia Birchii*. It is a native of Western Queensland and New South Wales. It is unpalatable to stock, and is one mass of seeds which are easily carried about. On this account it has overrun large areas of heavily stocked county in Western Queensland, and has become particularly abundant on some of the main stock routes. It is a spreading, intricately branched, somewhat woody plant about 2 to 3 ft. high. The stems and leaves are clothed with a white cottony wool, which tends to disappear from the older parts. The leaves are quite small, mostly under half an inch long. The burrs are exceedingly numerous, one being borne practically in the axil of each leaf. They are densely clothed with cottony wool, and are armed with five slender, unequal spines, the longest spine on the older burrs being usually about one-third of an inch long. Each burr contains one or perhaps two seeds.

Mintweed is botanically *Salvia lanceolata*, and is a native of the United States and Mexico. It is a strong-smelling, much branched annual weed, the young parts clothed with short stiff hairs. The stems are angular. The leaves are densely clothed on the under surface with short stiff hairs, and are mostly 1 to 2 inches long and about a-quarter inch wide. The flowers are blue, and are either opposite or borne in whorls of three or four in slender terminal spikes. The ovary in the centre of the flower is four-lobed, and when ripe develops into four pale straw-coloured nutlets or seeds.

Johnson Grass.

F.T. (Charters Towers)—

Johnson Grass is poisonous, and the roots, or rather the underground stolens, which are white and succulent, have been the cause of deaths of both cattle and pigs. Johnson Grass is distinguished by the possession of these long, white underground runners. Soudan Grass is similar to it, but is of a finer growth and of annual character.

Another grass with which both are confused is *Sorghum verticilliflorum*. This particular one is extremely poisonous, perhaps the worst of the three. It is a strong-growing grass, fairly common in some parts, of a perennial character, arising from fresh buds at the base every year. Johnson Grass and Soudan Grass, I may mention, are both Sorghums. The former is *Sorghum halipense*, the latter *Sorghum sudanense*. The best plan would be for you to send specimens of the plants supposed to have caused the trouble.

The Mulgas.

D.C. (Eulo)—

The common Mulga extends through Queensland, New South Wales, and South Australia right over to Western Australia. As is natural in a tree of such a wide range, it shows considerable variation. In Western Australia and South Australia a few trees other than the common Mulga (*Acacia aneura*) are called Mulga with some prefix, such as Desert Mulga, Irishman's Mulga, &c. In Queensland, however, all the Mulgas belong to the one species (*Acacia aneura*). It varies in stature and width of leaf, and there is a good deal of confusion about the fodder value of the different forms; in some localities the broad-leaved form being considered the better, and in others the narrow almost round-leaved varieties being considered the best.

Mr. C. J. McMaster, when chairman of the Western Lands Board, forwarded for publication to Mr. J. H. Maiden, then Government Botanist in New South Wales, a few notes on the different forms of the common Mulga in North-western New South Wales, and his remarks probably apply to South-western Queensland. He distinguished four different kinds—namely, the Umbrella Mulga, a narrow-leaved form growing on hard, stony ground, and generally considered excellent feed for stock; the broad-leaved Mulga, a form growing in the valleys between stony ridges; the Black Mulga, a form with leaves small, dark, and narrow; the Yellow Mulga, the common form on the red, sandy, typical Mulga soils, and generally regarded as the best of the Mulgas; it commonly has a somewhat yellowish tinge in the foliage.

Intermediate forms between these different kinds occur, and in some districts a large number of Mulgas are recognised, though they are not given distinctive names.

Plants from South Burnett Identified.

S.L. (Tingoora)—

(1) *Vittadinia australis*, a common weed of the family *Compositæ*. We have not heard a common named applied to it, and it is not known to possess any particular properties, useful or otherwise.

(2) *Euphorbia pilulifera*, Asthma Weed or Asthma Plant, a very common weed in Queensland. The dried leaves are made into tea and used fairly extensively to give relief in asthma; hence the local name. We think, however, that the effects of the plant wear off after a certain time, the system becoming more or less used to it.

(3) *Chenopodium carinatum*, a very common weed in Queensland. We have not heard a local name applied to it. It contains a prussic-acid-yielding glucoside, but we cannot say we have ever observed it to be eaten by stock to any extent, certainly not in sufficient quantities to cause trouble.

(4) *Solanum nigrum*, Garden Nightshade. The ripe berries are freely eaten by children, and are sometimes used for cooking without any ill-effects following. Occasionally trouble is experienced from the plant, and this is probably due to the berries being eaten in an unripe condition. They contain the poisonous principle Solanin, which tends to disappear as the berries ripen.

(5) *Stachys arvensis*, Stagger Wood, also called Wild Mint or Mintweed, but not to be confused with the Mintweed that has been given a good deal of prominence in the Press during the last couple of years. It causes "staggers" or "shivers" in working or travelling stock, but ordinary paddock stock eat the plant with impunity.

(6) *Gallinsoga parviflora*. Yellow Weed, and sometimes called Chick Weed, though this latter name more correctly belongs to another plant.

(7) *Euphorbia Drummondii*, Caustic Creeper, a very common weed in Queensland. On the whole, paddock stock, when they do eat the plant, seem to suffer little or no ill-effects from it. With travelling stock, however, much trouble has been reported. In New South Wales tests with the plant have on many occasions given a positive reaction for the presence of a prussic-acid glucoside, but repeated tests with Queensland specimens have always given negative results, and the symptoms described by experienced stock-owners in Queensland are certainly not those of prussic-acid poisoning. The head and neck of affected animals swell considerably. If the swelling is pierced an amber-coloured fluid exudes, and the life of the beast may be saved.

(8) *Oxalis corniculata*, Wood Sorrell.

(9) *Rumex Brownii*, Dock.

(10) No flowers, but we should say *Geranium dissectum*, Crow-foot; an excellent pasture plant, sometimes known as Wild Carrot, though this name more correctly belongs to a different herb. It is especially favoured by sheep.

Red Ash.

F.A.B. (Marmor)—

The specimen is the Red Ash (*Alphitonia excelsa*), a very common tree, widely distributed in Queensland and New South Wales. Stock, particularly horses, are very partial to it, and it is an excellent drought fodder. In addition to Red Ash, it is sometimes called Silver Leaf, Silver Wattle, White Ash, and other names, though, of course, it is not related to the true Wattles in any way, and belongs to a family of plants known as the *Rhamnaceæ*. Red Almond is the name adopted by the Forestry Department for the timber of this and some allied species. The leaves are somewhat saponaceous, and are commonly used by school children as a substitute for soap.

The Clove Tree.

W.G. (Cairns)—

We do not know of any Clove Tree in Australia, and you would have to import plants. The tree is rather difficult of propagation, and it is a few years before the first crop is borne. The present seat of the industry is at Zanzibar, which supplies about 90 per cent. of the world's requirements. It is possible you could obtain seeds or plants from some tropical nurseryman at Java, and if you write to the Director, Botanic Gardens, Buitenzorg, Java, Dutch East Indies, he may put you in touch with someone.

A Common BeachTree (*Ochrosia*).

E.C.D. (Townsville)—

The specimen is a species of *Ochrosia*, and we should say *Ochrosia elliptica*, a very common beach tree in parts of North Queensland and the islands of the Pacific. It is very common on some of the islands, such as Hayman Island, and is very noticeable on account of the great quantity of bright-red fruits it bears. So far as we know, these fruits are not edible, though we have no definite information on this point. The plant belongs to a poisonous family, the *Apocynaceæ*, and must therefore be looked on with suspicion. We have often noticed, however, that the fruits on the ground have been eaten to a limited extent by wild animals and birds. We do not know of a common name for the plant.

Red Flowering Gum.

L.G. (Toowoomba)—

We do not remember having seen the red-flowering Gum grafted on another stock. The plant is so readily raised from seed, and comes fairly true to type, that the practice of grafting plants is not resorted to. If you wish, however, to try your hand at grafting the red-flowering Gum on some of the Eucalypts about Toowoomba, the closest allies of the red-flowering Gum growing in your district are the Bloodwood, Spotted Gum, and Moreton Bay Ash. We should think trees about half an inch in diameter could be taken, and this month would probably be as good a time as any to do the work.

Flannel Weed.

A.J.E. (Brisbane)—

The specimen forwarded is the Flannel Weed, *Sida cordifolia*, a plant widely spread as a weed in most tropical and subtropical countries, including Central and North Queensland. It has been established in North Queensland for many years, particularly about some of the northern towns, such as Townsville and Cairns, and of late has spread more south, though in the more southern parts it does not seem to be the pest it is in the North. Arsenical sprays could be used in its eradication, but, of course, these are impracticable where stock are running, and in any case a certain amount of danger is always incurred when weeds are sprayed in stock country, even though reasonable caution may be used. Hand-pulling is rather expensive, but most of these *Sida* weeds, such as *Sida retusa* and the present species, can be kept down by several mowings. Scything would have to be done several times before the rootstock was exhausted. The plant possesses no harmful properties, not being poisonous to stock in any way.

Pimpernel.

G.R.I. (Gympie)—

The specimen bore neither flowers nor seeds, and in such cases it is difficult to name with certainty, but we should say it is the common Pimpernel (*Anagallis arvensis*). It is not a member of the Pea family, but from the name "Blue Pea" it is probably the blue flowered form. The plant is definitely poisonous, but on the whole is unpalatable to stock. Dr. Gilruth stated that the plant was responsible for the death of a large number of sheep in Victoria, apparently acting as a narcotic poison. The only case of definite poisoning by it that has come under our notice in Queensland was at Buderim Mountain, from where we received a quantity of seeds of the plant with the report that they were abundant in the paunch of a cow that had died from plant poisoning.

Trees for the West.

Inquirer (Brisbane)—

Your specimen is *Codonocarpus cotinifolius*, the Bell Fruit, a native of Western Queensland and the neighbouring States. It occurs in the northern parts of South Australia, where it is generally known as Native Poplar. Regarding trees for the West, the following are some suggestions:—Bottle Trees, both narrow and broad leaved varieties; Currajong; Parkinsonia Tree; *Albizzia Lebbek*, commonly known in Western Queensland as Acacia; White Cedar; Pepper Tree; *Celtis sinensis*, commonly called Portuguese Elm; the Citron-scented Gum; Narrow leaved Ironbark; *Bauhinia Hookeri*; Phytolacca or Bella Sombra Tree; *Acacia arabica;* Camphor Laurel; Pittosporum; and Algaroba Bean.

Water Gum. Tea Tree.

H.I.J. (Nundah)—

The Water Gum is *Tristania exiliflora*. This species is very common along watercourses in Eucalyptus country in North Queensland.

The Tea Tree is *Melaleuca linariifolia*. The principal constituents of the oil of this tree, according to Penfold, are terpinene, cymene, cineol (16-20 per cent), a terpineol, sesquiterpenes, &c. These constituents have been shown to have a high germicidal value. The oil from the species in Southern Queensland is being extracted in some cases.

Sunrise and Moonrise at Mackay and Warwick.

M.J.O'D. (Sarina)—

Your question as to the difference between the rising and setting times of the sun and moon at Mackay, as compared with Warwick, was referred to the Surveyor-General, Mr. J. P. Harvey, who advises as follows:—

SUN.

Warwick.			Mackay.		
1934.	Rise.	Set.	1934.	Rise.	Set.
	h. m.	h. m.		h. m.	h. m.
June 22	6 43	17 4	June 22	6 39	17 29
Dec. 23	4 53	18 49	Dec. 23	5 19	18 45

MOON.

Warwick.				Mackay.			
	Rise.		Set.		Rise.		Set.
1934.	h. m.		h. m.	1934	h. m.		h. m.
Jan. 26 ..	15 41	Jan. 27 ..	1 51	Jan. 26 ..	15 33	Jan. 27 ..	2 21
Feb. 10 ..	0 44	Feb. 10 ..	15 28	Feb. 10 ..	1 14	Feb. 10 ..	15 20

Note.—The table uses the 24-hour divisions—thus, 17h. 4m. equals 5.4 p.m.

The times of rising and setting of the sun are given at both solstices—that is when the sun is at its maximum northern and southern positions. Similarly, the moon is at its maximum northern and southern positions on 26th January and 10th February respectively. An examination of the table will show the range of differences between the two places.

Scours in Calves.

Inquirer (Brisbane)—Mr. K. S. McIntosh, B.V.Sc., Animal Health Station, Yeerongpilly, advises: This case may be due to—

(1) The sudden change in diet from whole to skim milk. This process should be carried out gradually. The skim milk should be fresh and free from froth. Up to half a pint of lime water to each gallon of milk will assist digestion. The milk should be fed at blood heat.

(2) Bacteria or germs present in the bowel causing white scour, red scour, or blood scour. White scour usually affects animals up to ten days old, while blood scour generally attacks them when over fourteen days. Whichever form is present, it should be regarded as contagious, and healthy animals running in the same pen may pick up the disease from droppings, &c.

Infection may take place through the navel at or shortly after birth or be sucked from the dirty teats of the mother. Treatment is often not worth while, particularly in severe cases.

Preventive Measures.

(1) Discard old pens and yards and build new ones which will not receive drainage from the old ones. Only place new healthy calves in new pens.

(2) Isolate healthy from scouring calves.

(3) Scrub all feeding utensils with soda and scald well.

(4) Permit cows to calve in a clean dry paddock, and allow the calf to suck its mother as long as possible.

(5) Tie the navel as soon as possible after birth with a piece of tape dipped in tincture of iodine. Cut off the navel cord below the tape and swab stump with tincture of iodine.

(6) If calves are taken away from mother soon after birth feed on warm whole milk for at least two weeks. Feed little and often and change gradually on to skim milk. Keep all utensils scrupulously clean.

(7) Add half a pint of lime water and one teaspoonful of formalin to each gallon of milk fed. If calves show signs of constipation discontinue the formalin and, if necessary, replace it with castor oil.

Mat Grass.

W.F. (Traveston)—

The specimen of grass is Mat Grass or Carpet Grass (*Axonopus compressus*). Two forms of the Carpet Grass occur in Queensland, a broad-leaved form and a narrow-leaved form, and your specimen represents the latter. This is now generally regarded as the inferior of the two. Mat Grass has occasioned some concern on parts of the North Coast line on account of its invading Paspalum pastures, and requests have been received to have it declared a noxious weed. The Department has not recommended that such action be taken because, although Mat Grass is certainly a very objectionable grass when it comes into Paspalum pastures, it nevertheless has a certain value on second-class country. There are several quite large pastures of Mat Grass in coastal Queensland, and the enforcement of the Act, if the plant were declared a noxious weed, would be almost impossible. Where Mat Grass makes its appearance in a Paspalum or Rhodes Grass pasture it decreases very much the carrying capacity of the pasture, and its eradication should be attempted. The best way would be to plough the infested area and resow with Paspalum, Kikuyu, Giant Couch (*Brachiaria mutica*) or Rhodes, and so smother the Mat Grass. A pasture so treated would, of course, have to be given a spell from stock.

In answer to a correspondent, Mr. Cyril White has supplied the following notes:—

Noogoora Burr—

After the heavy spring and early summer rains there was a prolific growth of seedlings of the Noogoora Burr this season, and one or two cases of poisoning by the seedling plants were brought under the notice of the Department of Agriculture and Stock. It does not seem to be generally known that Noogoora Burr is poisonous when quite young and still bearing the seed leaves. The plant probably loses its toxicity, however, when a few weeks old.

The Noogoora Burr is a robust annual weed up to 6 feet or more high, the female flowers eventually forming hard, woody burrs which, when ripe, are about 1 inch long and densely covered with hooked spines. These burrs contain two seeds, one of which usually germinates one year, and the other the following. It is a native of North America, and is supposed to have been introduced into Queensland with cotton seed from that country about seventy years ago.

The genus *Xanthium* consists of twenty-five distinct species, and according to Dr. F. J. Widder, who has recently written a complete account of them, the Queensland plant is *Xanthium pungens*. In the United States and Canada the Noogoora Burr and its allies are known as Cockle Burrs. They are there recognised as being poisonous in their seedling stage, but United States authorities state that experimental work has shown that beneficial results follow the administration of oils and fats to affected animals. For this purpose linseed oil, bacon grease, or lard can be used.

The Entomological Branch of the Department of Agriculture and Stock, acting on behalf of the Council for Scientific and Industrial Research, has recently liberated in Queensland a number of colonies of the Noogoora Burr Seed Fly (*Euaresta aequalis*). This parasite has been introduced from Kansas, and its effect on the distribution of the pest is awaited with interest.

Wild Mint—

Wild Mint (*Salvia reflexa*, previously recorded as *Salvia lanceolata*) is somewhat on the increase, and has been recorded from a few fresh localities. For those who are unacquainted with this plant it might be mentioned that it is a strong-smelling, much-branched annual weed. The leaves are densely clothed on the under surface with short, stiff hairs, are mostly 1 or 2 inches long and about ½ inch wide. The flowers are borne in spikes, are blue, and about ⅛ inch long. The ovary borne in the centre of the flower is four-lobed, and develops later on into four pale-straw coloured nutlets or seeds.

It is a native of the United States and Mexico. No definite cases of poisoning by it have come under the notice of the Department of Agriculture and Stock during the past season. Losses from it are mainly in travelling stock, ordinary paddock stock seeming to feed among the plant taking an occasional bite without any ill effects following.

Galvanised Burr—

The Galvanised Burr (*Bassia Birchii*) has spread very much on stock routes and on closely settled country. It is the general opinion held by both pastoralists and officers of the Department of Agriculture and Stock that a good growth of grass will in one or two seasons choke out the Galvanised Burr, but during the past season this does not seem to have been borne out by facts, and the plant seems much on the increase.

Though most abundant in the West, it is commonly seen in more coastal localities, seeds having dropped from sheep trucks, and is now and again met with as a weed on coastal fruit farms where scrapings from sheep trucks are used as manure.

For those unacquainted with the plant, it might be mentioned that it is a spreading, intricately branched, somewhat woody weed about 2 to 3 feet high. The stems and leaves are clothed with a white cottony wool, more or less disappearing from the older parts. The leaves are small and mostly under $\frac{1}{2}$ inch long. The burrs are exceedingly numerous, one being borne practically in every leaf axil. Each burr bears mostly one seed, and as they are borne in great abundance the plant is easily spread from one place to another.

Weir Vine—

The Weir Vine has attracted some considerable attention during the past twelve months owing to the rapidity with which it is spreading in parts of the southern Maranoa. The Weir Vine is a creeping plant, the roots producing large underground Sweet Potato-like tubers. The leaves are fairly large, sometimes over 4 inches across. The plant is a member of the *Convolvulaceæ* or Morning Glory family, and the flowers are large, about 3 inches long; they mostly come out pinkish-red and turn to blue. The seed capsules are rather large, being about $\frac{3}{4}$ to 1 inch in diameter, and contain several blackish angular seeds.

The botanical name of the Weir Vine is *Ipomœa calobra*, the specific name *calobra* being given to it on account of its being known to the aborigines on the Barcoo as Calobra. It is most abundant in Queensland in the hard red soils of the southern Maranoa.

The importance of the plant lies in the fact that stock that take to it become affected in much the same way as those affected by Indigo or Darling Pea. They have a wild staring look in their eyes. Cattle will try to catch their tails, and in bad cases they go in the loins. Horses are affected in much the same way. They rear up, try to climb trees, &c., and sometimes so injure themselves that they have to be destroyed. Some stockowners think it is the pods that cause the damage and not the leaves only, but on this point we have no definite information.

The large underground tubers are quite harmless, and were used as food by the aborigines. Some white people who have used them say that when cooked they do not taste badly. They are evidently quite harmless raw, because bushmen often chew or suck the raw, rather juicy tubers to allay thirst.

A New Grass Genus.

E.H.B. (Miles)—

You may remember that when Mr. Hubbard was in Queensland you sent down specimens of a grass which was quite new to us and which did not agree with anything previously in our collections. It will interest you to know that Mr. Hubbard has now named this as a new genus of grasses under the name of *Homopholis*, and he has given the grass the name of *Homopholis Belsonii*. The specimens you collected at the head of Dogwood Creek, east of Gurulmundi, in November, 1930, are the only specimens we possess, but we expect to get a few more in from the Western Downs and Maranoa district before very long.

Woolly Finger Grass.

R.S.McK. (Mungallala)—

The Woolly Finger Grass (*Digitaria eriantha*) should grow quite well in your district. We think that it has a future in parts of the Maranoa and Western Darling Downs, particularly in sandy lands at present occupied by Spear grasses or short-lived summer species. If propagated by roots in the spring or early summer it should soon send out runners and establish itself, but stock, of course, would have to be kept off it for a few months until the grass became strong enough to stand feeding.

General Notes.

In Memoriam.

Mrs. Alexander Robert Henry.

The many friends of Mr. Alec. Henry, the secretary of the Central Sugar Cane Prices Board, will regret to learn of the passing of his beloved wife, which sad event took place at her home at Clayfield, Brisbane, on Monday, 9th July. The late Mrs. Henry was in her usual good health on the morning of the day of her death, and after attending to her home duties, left for the railway station to fulfil an engagement in the city. While waiting for the train she was overtaken with a seizure and conveyed back to her home, where she gradually sank and passed away at midday. The deceased lady possessed a charming personality, and was associated with many charitable and social organisations. Her friendships encircled many people throughout the State who will mourn with her bereaved relatives in the loss of a splendid wife and mother. The funeral moved from her residence at Clayfield for the Nundah Cemetery on the following day, the long cortege consisting of representative men of the Department of Agriculture and Stock, including the Minister, the Hon. Frank W. Bulcock, the sugar industry, and the business life of Queensland. We extend our deepest sympathy to her sorrowing family in the tragic loss they have sustained.

Canary Seed Board.

The Canary Seed Board election resulted as follows:—

	Votes.
George Burton (Cambooya)	200
Garret Denis O'Neill (Allora)	199
Michael Coleman (Nobby)	149
Edwin Sylvester Maher (Allora)	90

Messrs. Burton and O'Neill are the present members of the Board, and will therefore be reappointed for a further term of one year as from the 1st June.

Trans-Border Stock Crossings.

Following an outbreak of ticks in New South Wales in close proximity to the Stanthorpe Killarney area, an Order in Council has been issued placing certain restrictions on the introduction of stock at all crossing places between and including Wallangarra and east to Stanthorpe. This means that all cattle and horses entering the State must be provided with a certificate of health and freedom from ticks, and a certificate that they have been dipped or hand-dressed as prescribed within seven days before crossing. Also they must be found clean upon inspection at the crossing places, and again dipped or hand-dressed.

State Wheat Board.

A regulation has been approved under the Wheat Pool Acts, which will provide that the four representatives of wheatgrowers on the State Wheat Board appointed for the period from 1st September, 1933, to 31st August, 1934, may be appointed to be members of such Board for a further period not exceeding eight months, as the Minister shall think fit.

Staff Changes and Appointments.

The following have been appointed members of the Stallion Boards hereunder specified:—

East Moreton District Stallion Board.—Messrs. J. C. J. Maunder, B.V.Sc., Government Veterinary Surgeon (Chairman), W. Frood, and S. R. Watson.

Wide Bay District Stallion Board.—Messrs. A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon (Chairman), R. J. F. O'Bryen, and G. Elliot.

Burnett District Stallion Board.—Messrs. A. F. S. Ohman, M.V.Sc., Government Veterinary Surgeon (Chairman), R. J. F. O'Bryen, and G. Elliot.

Central Coast District Stallion Board.—Messrs. J. C. J. Maunder, B.V.Sc. (Chairman), W. C. Jeffery, and J. Sprott.

Northern Coast District Stallion Board.—Messrs. A. F. S. Ohman, M.V.Sc. (Chairman), M. F. Yore, and R. Tait.

Miss D. Bowder, Assistant Cane Tester at Inkerman Mill, has been transferred to the position of Cane Tester at Maryborough Mill in lieu of Miss D. Marles, resigned. The following Assistant Cane Testers have also been appointed:—Miss A. Smith (Cattle Creek Mill), Mr. A. R. Hughes (Inkerman), Mr. F. P. Mulligan (Invicta), Miss A. L. Dahl (Isis), Mr. E. J. Delaney (Kalamia), Miss P. Eadie (Qunaba).

Messrs. R. Lauder (Tully) and H. B. Randall (Facing Island, Gladstone) have been appointed Honorary Rangers under the Animals and Birds Acts.

Acting Sergeant C. P. Murray, Jundah, has been appointed also an Inspector under the Brands Acts.

Constable J. Geraghty, of Injune, has been appointed also an Acting Stock Inspector and Inspector of Brands.

The Officer in Charge of Police, Eton, has been appointed also an Acting Stock Inspector.

Messrs. A. Menkins, A. E. Bonnet, and V. B. Martin have been appointed Assistant Cane Testers at the Cattle Creek, Invicta, and Plan Creek Sugar Mills, in lieu of Miss A. Smith, Mr. F. P. Mulligan, and Miss E. A. Crees, who have resigned.

The Council of Agriculture.

An Order in Council has been issued in pursuance of the provisions of the Primary Producers' Organisation and Marketing Acts, declaring the number of members of the Council of Agriculture to be twenty-eight. A regulation has also been issued prescribing the members of Commodity Boards who shall be members of the Council. These include two members of the Butter Board, Messrs. J. McRobert (Maryborough) and W. J. Sloan (Malanda), and one member each of the remaining Commodity Boards, Messrs. H. T. Anderson (Biddeston), Cheese Board; J. Beck (Stanwell), Cotton Board; L. R. Crouch (Atherton), Atherton Tableland Maize Board; C. Brumm (Woongoolba), Arrowroot Board; C. F. Adermann (Kingaroy), Peanut Board; R. V. Woodrow (Woodford), Honey Board; H. Kessler (Cambooya), Barley Board; A. McLauchlan (Boonah), Egg Board; H. Niemeyer (Hatton Vale), Broom Millet Board; G. D. O'Neill (Allora), Canary Seed Board; D. Johnston (Malanda), Northern Pig Board; and G. A. Duffy (chairman of the Timber Advisory Committee), Plywood and Veneer Board. The Committee of Direction of Fruit Marketing, the Queensland Cane Growers' Council, and the Wheat Board are also included, and their representatives are: Messrs. W. Ranger (Brisbane), G. Johnson (Mirani, Mackay), and W. J. Brimblecombe (Pirrinuan). The Minister for Agriculture and Stock (Hon. F. W. Bulcock) is President of the Council, and the Director of Marketing (Mr. E. Graham) is a member by virtue of his office.

Removal of Citrus Plants from Elimbah District Prohibited.

Owing to an outbreak of Brown Spot disease of mandarins in the Elimbah district, a Proclamation has been issued under the Diseases in Plants Acts, prescribing such district to be a quarantine area and prohibiting the removal of any citrus plants therefrom.

Pineapple Levy Regulations.

A regulation has been issued under the Fruit Marketing Organisation Acts empowering the Committee of Direction of Fruit Marketing to make a levy on all pineapples marketed for the year ending 19th August, 1935. The levy is similar to that of last year, namely:—

(*a*) On all pineapples sold or consigned whether by rail, road, or boat, to fruit-canners, at the rate of 1d. per case.

(*b*) On all pineapples sold or consigned by rail to agents, or others, except to factories, at the rate of 1s. 4d. per ton, with a minimum of 1d.

(*c*) On all pineapples sold or consigned otherwise than by rail to any Queensland railway station to any agent, or firm, except to factories, at the rate of ½d. per case, with a minimum of 1d.

Where sold loose, the levy shall be ½d. (with a minimum of 1d.) for 24 smooth leaf pineapples or 42 rough or ripley pineapples, as being equal to a case of fresh pineapples.

Every company or person carrying pineapples for any market other than for railing from any station, shall furnish a monthly return to the C.O.D. regarding the fruit carried.

The levy on all fruit railed from any Queensland railway station (except Toowoomba, Townsville, Rockhampton, Roma Street, Woolloongabba, Brunswick Street, South Brisbane, or Central Stations) to any other Queensland railway station, and not consigned to factories, may be collected by the Commissioner for Railways to the extent of 1s. 4d. per ton, with a minimum of 1d.

Subject thereto, and except as provided, the levy in the first instance shall be collected on all pineapples sold or consigned by rail or otherwise to factories by the C.O.D. at the rate of 1d. per case; on all fruit delivered otherwise than by rail to any railway station to any agent or person except a factory, by such agent or person at the rate of ½d. per case, with a minimum of 1d.

The sums raised by the levy shall be expended by the C.O.D. in the interests of the pineapple-growers.

Proposed Co-operative Flour Mill.

In the course of a recent Press statement, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, said that it was gratifying to him to note that definite steps had been taken towards the formation of a co-operative flour milling company, and that this company was about to be registered under the Companies Act. Originally an application was made for registration under the Primary Producers' Co-operative Associations Acts, but those Acts require that share holders shall be direct suppliers to the mill. With our pool system in operation, every producer is a direct supplier to the Board, and therefore only the Board can supply to the mill. This difficulty was not visualised when the original legislation was passed, but, as the Acts stand at the present time, the wheat farmers interested in the establishment of a co-operative mill are definitely debarred from participation under the Co-operative Associations Acts. However, said Mr. Bulcock, it was his intention to make certain recommendations involving an alteration in those Acts, in order that pool boards may be regarded as suppliers within the terms of those Acts. He anticipated that amending legislation would receive the early attention of Parliament.

Appeal against Declaration of an Abandoned Orchard.

Regulations have been issued under the Diseases in Plants Acts which provide that, when an occupier or owner of a piece of land who has received notice from the Minister that under the powers conferred by the abovementioned Acts it is intended to declare his orchard or nursery an abandoned orchard or nursery desires to appeal against such decision, the appeal must be lodged within a period of twenty-one days from the date of the notice by the Minister. The appeal must be made in a special form, as prescribed, to the Clerk of Petty Sessions for the Petty Sessions District in which the land concerned is situated. A notice of intention to appeal, in a specified form, must also be forwarded to the Minister. The Clerk of Petty Sessions shall fix a time and place for the hearing of the appeal, and shall notify the parties concerned.

Dairy Cattle Improvement Act, End of Controversy.

At a special conference of Dairy Companies of Queensland, convened by the Queensland Butter Board, the payment of the levy under the above Act was the principal matter discussed. Representatives of practically all the companies in Queensland were present, and a resolution was carried—Maryborough being the only dissentient—that the companies would pay the levies imposed under the Act.

The Maryborough company intimated acceptance of the resolution. This means that Maryborough will now make its contributions to the Butter Board.

Animal and Bird Sanctuaries Proclaimed.

The following sanctuaries have been declared in pursuance of the provisions of the Animals and Birds Acts:—Pig and Sheep Islands, in Noosa River; Mount Wooroolin Park Reserve, Kingaroy; the property adjacent to the Town Common, Townsville, known as the Old Cluden Racecourse; and "The Plains," Boondooma, via Preston. It will, in future, be an offence to take or kill any animal or bird on the abovementioned properties.

The Tobacco Industry Portection Act in Force.

A Proclamation has been issued bringing into operation, as from 12th July, the Tobacco Industry Protection Act, a measure passed last session. Orders in Council have also been issued constituting districts and declaring certain diseases, pests, and fungi under the Act. Regulations to give effect to the provisions of the Act have been promulgated.

A number of Officers of the Department of Agriculture and Stock, including Field Officers of the Agricultural Branch, Inspectors under the Diseases in Plants Acts, and Officers of the Entomological Branch, have been appointed also Inspectors under the Tobacco Industry Protection Act.

An Order in Council under the Diseases in Plants Acts, relative to the eradication of tobacco plants, has been rescinded, as the Tobacco Act covers the destruction of old plants.

The Plywood and Veneer Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, amending the constitution of the Plywood and Veneer Board by inserting a provision which will empower the Minister, upon the recommendation of the Board, to direct, by public notification in the *Gazette*, that no person shall deliver any plywood and/or veneer to the Board before the date mentioned in such notification. The following consequences shall ensue until the date mentioned:—Growers shall deliver to the Board each month, or at times decided by the Board, a return showing the total quantities of plywood and/or veneer manufactured during the preceding month, and the names and addresses of those to whom the commodities were delivered. Agents for the sale of the commodities shall deliver to the Board, when so required by the Board, returns showing the quantities of plywood and/or veneer sold by them during the preceding month, or term fixed by the Board, and the prices realised therefor. The Minister may appoint any person to inspect any books and accounts of growers or agents.

Banana Board.

An Order in Council has been issued under the Banana Industry Protection Act, providing for a levy on banana growers to be used for the maintenance of the Banana Industry Protection Board. The levy is the same as that imposed during the last few years, and is at the rate of 1½d. per case containing 1½ bushels or less for all bananas marketed in the case, and 2d. in the £ or part thereof on the proceeds of sales of all bananas marketed in the bunch. The levy will be effective for a period of twelve months as from 1st August next.

Regulations under the Dairy Products Stabilisation Act.

Regulations have been issued under "*The Dairy Products Stabilisation Act of* 1933." These provide for the appointment of officers of the Dairy Products Stabilisation Board; the conduct of business at meetings of the Board; resolutions; vacancies on the Board; committees; and consultations with other Boards. Further, it will be necessary for manufacturers to keep registers of dairy products manufactured or processed. Provision is made for penalties and for prosecutions.

Orchard Notes for September.

THE COASTAL DISTRICTS.

SEPTEMBER is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as, if the trees are not in this condition, they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the trees; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by systematic cultivation, except in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth, or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth—the orchard should be manured with a quick-acting, complete manure, such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the foregoing has been written mainly in respect of citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug, and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Care should be exercised in the selection of suckers, butts, or bits. Either of the two latter are preferable, and in the case of suckers which have broken into leaf, these should also be cut hard down to the butt. Before planting, all roots should be cut off closely and the surface pared or scraped, excepting over the buds or eyes which

are allowed for development. Where the butts are split into sections (up to four) according to the number and placements of eyes, these are planted with the eye or eyes facing downwards. In the case of butts, two to three eyes are left spaced around the butt, and surplus ones being removed, the top having previously been cut down to the corm and the centre scored out. Better growth is evidenced in each case, and as no cut surface is made available (each "plant" being covered by a few inches of soil immediately) beetle-borer infestation is not shown.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers; also all bases of plants which have fruited.

When necessary, manure—using a complete fertilizer rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash —two of the former to one of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared —viz., brought into a state of perfect tilth to a depth of at least 1 ft.—more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure; which should, however, contain no superphosphate, bonedust or Nauru phosphate being preferable.

Old plantations should be kept in a good state of tilth and be manured with a complete fertilizer in which the phosphoric acid is in the form of bonedust, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable passion vines can also be pruned now, as if cut back hard they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed with Bordeaux mixure from then till the time the fruit is ready to colour, in order to prevent loss by downy mildew or anthracnose. Sulphuring may be required against powdery mildew.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

WHERE not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts, which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

Farm Notes for September.

WITH the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghum, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Check-row seeding in this crop is to be recommended, permitting as it does right-angled and diagonal cultivation by horse implements, minimising the amount of weed growth, and at the same time obtaining a soil mulch that will, with the aid of light showers, assist to tide the plant over its critical period of "tasselling."

Although cotton may be sown this month, it usually stands a better chance if deferred until October. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Peanuts, sweet potatoes, arrowroot, cow cane, and in those districts suited to their production yams and ginger. Plant out coffee.

Rural Topics.

Care of Breeding Sows.

To obviate loss of condition owing to excitement and fever during "oestrum" or the period sow pigs are "on heat" during the stages when mature sows are being prepared for the bacon factory, it is suggested that the sows be mated to the boar about one month before date when it is desired to market them. This procedure is described in some text-books as "settling the sow," which really means encouraging her to "top up" more readily and be ready for slaughter ahead of the date she would be ready if the period of oestrum interfered with her development. However, there is always a risk associated with this, for it may so happen, owing to bad weather, bad roads, or other happenings, that it may not be convenient to market the sows when one month in pig only. If they are advanced in pregnancy, and are definitely showing as in pig, there may be an objection on the part of the buyer to purchase, and in the end the in-pig sow may realise less and prove less profitable than the sow not in pig which has taken a week or two longer to reach the marketing stage. Young sows should not, of course, be mated, as in this case it is both unwise and unnecessary.

There is an old belief that the sow is more likely to prove in pig—i.e., to hold to the service of the boar if she is mated late on the second or early in the third day of the period of oestrum. This period of being "on heat" lasts for three days, and recurs every twenty-one days until the sow becomes pregnant. It is often difficult to detect signs of oestrum on the first day of its occurrence, but if at all possible it is advisable to mate again on the second or third day even if the sow is first mated on the first day of the period. It is preferable also to mate about three days after weaning of the litter at eight weeks. Actually the sow will come in season three days after farrowing, and every three weeks after that, but, as stated, mating should be deferred till weaning takes place if the sow is normal and has suckled a good litter. It is not advisable to defer mating any longer unless there are special reasons for so doing.

When the sow is coming in season—she invariably becomes excited—there is a distinct restlessness and a tendency to jump on the back of other sows. A sow may even become a fence-breaker, and may wander away a considerable distance looking for a mate, or she may become very stubborn and refuse to move if approached. It pays to exercise considerable care and to be very patient with the animals at that time. In-pig sows should not be permitted to graze together with those suckling litters or that are not in pig, as accidents may happen. The sows may fight or interfere with one another, or the boar may knock them about. He should not be allowed to run with them except on special occasions, and even then care should be taken to see that he does not injure the sows or young pigs or that the sows do not injure him, for they sometimes fight and injure one another.

When sucking pigs are four weeks old (some will commence earlier) they should be encouraged to feed apart from the sow, and for this purpose should be provided with a trough in a separate enclosure. In fact, they will be all the better for having good grazing or succulent green food in addition to the sows's milk. They also like charcoal, and love to lick a block of rock salt. These latter supply minerals which are very necessary in the development of their bony and muscular systems. As the strongest pigs of the litter are usually those which have regular access to the teats to the front of the sow's udder (the teats nearest the forequarter), it may be an advantage to wean them earlier than the smaller ones in the litter; hence if they are able to feed on their own as separate from the sow it will be all the better for them and will enable the breeder to "even up the litter" and give the smaller ones a better chance.

The practice of spaying sows—that is, of removing their ovaries (part of their breeding organs) for a similar purpose to that in view in castrating male pigs—is not advised under conditions such as those ruling in the marketing of pigs in this country. Sow pigs do not usually come in season to any extent before the sow is six months of age, and if she is being prepared for pork or bacon she should be marketed or be ready for market before six months old. Similarly it does not pay to spay older sows, for the operation is not only a difficult one but a risky one, and it takes the sow some time to recover and get back to normal. The spaying of sows is not practised at all in Australia, although castration of the male pigs is a regular practice on every pig farm.—E. J. Shelton, H.D.A., Senior Instructor in Pig Raising.

Heredity and Environment.

At the Carrick Agricultural Discussion Society (Scotland) recently, a lecture was delivered by Mr. A. D. Buchanan Smith, Institute of Animal Genetics, University of Edinburgh, on "Heredity and Environment."

Mr. Buchanan Smith said what an animal is or what it does is the outcome of two forces acting upon each other—heredity and environment. The force of heredity provides an animal with certain qualities. As to whether these qualities are to be developed to their utmost depends upon environment. Environment can, indeed, completely mask the existence of certain hereditary qualities. Practically every character in plants, animals, and man is to a greater or less extent conditioned by heredity. Some characters are practically entirely due to heredity, with environment playing little or no part in their expression. An instance of this may be found in coat colour. The mode of the inheritance of coat colour in cattle affords an excellent example of some of the ways in which heredity works.

If we mate a black Aberdeen Angus to a red Shorthorn the progeny are all black in colour, taking after the Aberdeen Angus parent. If we mate two of these crossbreds together we find that, while the majority of the calves from these crossbreds are black, about one-quarter of them are red. In the same way, while the first cross calves from Aberdeen Angus/Shorthorn parents are polled, the second cross consists largely of polled animals, but about one in four are horned. If we were to raise an infinitely large population of the second cross animals, we would find that the proportion that appeared either red or horned would be exactly one in four. When we are working with smaller numbers the proportion may be slightly different. It is like tossing a penny. If you toss a penny a thousand times, you will get very nearly 500 heads and 500 tails. If, however, you toss it only a small number of times you may easily chance to get quite a big proportion of heads and small number of tails. The point to be emphasised is that the machinery of heredity works in a precise and mathematical manner. Where we know enough about the mode of inheritance in a character, we can predict the odds concerning the appearance of that character in the progeny.

Another Type of Inheritance.—An example of another type of inheritance can be found in the case of mating a White Shorthorn to a Black Galloway. The progeny of this cross will be all blue-grey. If you mate two of these first crosses together, then you will get calves that are black, red, blue-grey, roan, and white. Again, the colours appear in definite numerical proportions. The blue-greys will be the commonest, and next will come black and whites, followed by roan, while the reds will be comparatively rare. Incidentally, the majority of the whites will have black ears, but the odd one in sixteen will have red ears. We can predict the odds with which any of these colours will turn up.

So much for a character conditioned practically entirely by heredity. Unfortunately for the genetic—or hereditary—analysis of the problem, the majority of the productive characters of our livestock are conditioned both by heredity and environment. Let us take milk yield in cattle as an example. Before we can start to study the inheritance of milk yield, or to assess the inherent milking capacity of individual cows, there are many points which we must take into consideration. There is the age of the cow, the age at first calving, the month of calving, the interval between calving and service, and the length of the dry period. There are, besides, a lot of other points relating to the nutrition of the animal and the type of husbandry under which it is kept. Obviously, we cannot expect as good records on a farm a thousand feet above sea level, where very few concentrates are fed to the cows. Nevertheless, the animals reared on such a farm may possess as good an inheritance for the production of milk as higher yielding cows reared on lush lowland pasture.

Milk Inheritance.—How is milk inherited? If I could answer that question precisely and accurately, I would be able to make my fortune. Unfortunately, owing, as I have said, to the interactions of environment upon hereditary characteristics, we cannot be definite about the mode of inheritance of milking capacity, and it is unlikely for many years that we shall achieve this happy position. Nevertheless, a considerable volume of work has been accomplished in all parts of the world, but particularly on the Continent of Europe and in North America, which has laid open certain quite definite facts, and also points to other knowledge which, if not quite so definite, may be fairly helpful.

I do not propose to give you the tribulation of understanding the highly complex methods by which many of these research workers have set about their investigations. It is my intention to give you the results of their work, and, in anything that I say concerning the hereditary character of milk yield I would be grateful if you

would remember that even the best of inheritance can be masked by a bad environment, and that this fact, doubtless, accounts for many of the anomalous results which breeders may experience.

In the first place, total yield of milk is inherited quite independently of total yield of butter fat. Further, the total yield of milk which a cow may give is far more affected by environmental causes than is the total yield of fat. This leads to the apparently anomalous fact that when a cow goes off her milk there is usually a tendency for the percentage of fat to rise. This does not mean that the cow is secreting any more fat. She is probably secreting about the same amount of fat, but since there is a lesser quantity of milk, the percentage of it in the milk is increased. This also accounts for the fact that when you try to select for high-yielding cows alone and ignore the question of butter fat, you obtain animals which, while they are high yielders, give only a small percentage of fat. Actually, the fat that they give, when measured in pounds, is probably about the same as their ancestors gave.

Mineral Content of Milk.—As regards the other constituents of the milk, many of these are almost entirely conditioned by heredity and very little influenced by nutrition. Take, for instance, the mineral content of milk. With the one exception of iodine, it does not apparently matter how much minerals you put into the feed, they have very little effect upon the amount secreted in the milk. You must not, however, imagine that for this reason you can ignore the feeding of minerals to dairy cows. On the contrary, it is most important that you should do so for their good health. Similarly, the size of the butter fat globule is largely conditioned by heredity, but what is more important, especially to Ayrshire breeders, is the hardness of the curd of the milk. The softer the curd may be the more easily is the milk digested by infants and invalids. All investigations which have been made clearly show that the hereditary influence is most potent in this respect.

The colour of milk is the product both of environment and heredity. No amount of feeding can make an Ayrshire give milk the colour of that secreted by one of the Channel Island breeds. Suitable feeding may make it approach that colour, but with similar feeding, a cow of the Channel Island breeds would give a much yellower fat. There is considerable variation in the amount of the vitamins secreted in milk, but this appears to be in no way conditioned by inheritance.

Some Interesting Results.—Coming now to the inheritance of the total yield of milk, as I said before, I will not weary you with all the details, but will endeavour to give you some of the results. The most useful way in which the subject might be approached is to deal with the selection of a dairy beast. First of all, let us consider the purchase of a mature cow. In this case you have the definite records of the cow to go upon. For a constructive breeder to buy a dairy cow without knowing how much milk she is capable of giving is, to put it mildly, rather foolish. Undoubtedly conformation is an indication of the amount of milk which she can give, but it is not a reliable indication. The chief value of conformation is to be able to judge the general health of the cow and ability to live a long life.

As regards heifers, there is nothing in their conformation which can be taken as an indication of their milk-producing capacity. We are thus thrown back upon the pedigree. Pedigree, in conjunction with milk records, is of undoubted value. The parents are of primary importance. Of the two grand dams in the pedigree particular emphasis should be laid upon the productive qualities of the dam of the sire. To have wonderful producing great-grandparents, while the grandparents and parents are only mediocre is of no value whatsoever.

Then comes the bull. Most people like to bet on a certainty. The only thing approaching a certainty in the selection of a dairy bull is a proven sire, where his inherited qualities may be judged by the productivity of his daughters. A bull who has left his daughters giving milk above the average, and also more milk than their dams is indeed a valuable animal. This is really the best guide to the purchase of heifers, that they should be sired by a bull that has proved himself good. In the selection of a young bull particular attention should be paid to the milk-production of his dam.

The great thing to remember about the inheritance of productive qualities in our livestock is that animals inherit potentialities and not completed structures.

Tanning of Hides—The Chrome Leather Process.

In an issue of these notes of some months ago, details as to how to make white hide were published. While white hide is a useful leather for general repair work around about the farm, the making of chrome-coloured leather from horse or cow hide is a subject of frequent inquiry. In supplying this information, the

Lecturer-in-charge of the Sydney Technical College Tanning School points out that the average farmer may find himself at a disadvantage in following out the process owing to lack of plant and experience. The procedure is as follows:—

1. Soak and wash the hide immediately after it is removed from the carcase. Time for this operation, four hours.

If the hide has been salted, wash well and leave in water overnight. The best tanners find it difficult to obtain good results with dry hides, and the farmer should therefore avoid them if possible. If not possible, then wash and soak them, using plenty of clean water until they are soft. The time taken varies from two to three days.

2. Remove the hair by soaking the drained hides in milk of lime, using 30 lb. of lime to 100 gallons of water.

Handle each day and leave until the hair can be removed—about six to seven days in summer. If sodium sulphide is available, use 1 to 3 lb. per 100 gallons of lime liquor; this addition will reduce the time for unhairing to four days. The hair is scraped off with a clear-edged, not not sharp, knife.

3. Remove all flesh and fat by scraping with a knife. Wash well with several lots of water during the twenty-four hours after removing the hair and flesh.

4. Soak 1 lb. of bran for each hide in 4 gallons of water for twenty-four hours, and then use it as an extra wash for the hides. This will take four hours.

5. Make up a chrome liquor as follows:—6 lb. sodium bichromate, 6 lb. sulphuric acid, 2 lb. sugar.

Dissolve the sodium bichromate in 2 gallons of water, then add the sulphuric acid, and finally the sugar in small proportions. When the sugar is added the solution will boil furiously. If all the sugar is added at once the solution will boil over, but it should be kept boiling by the slow addition of sugar until the colour of the liquor changes from yellow to blue.

The above chrome stock liquor will tan 150 lb. of wet hide from the bran wash.

6. Add the chrome liquor to the tanning bath in three lots at intervals of one day. Use enough water to cover the hides and allow 3 lb. of salt for every 10 gallons of water; then place the hides in the salt liquors before adding the first portion of the chrome liquor.

Allow six days for complete tannage, when a cut section should show that the blue chrome salt has pentrated into the centre of the hide.

7. Neutralise by washing in water and then in a bath containing 1½ lb. of sodium bicarbonate for 150 lb. of wet hide. Time taken—16 hours.

8. The hides are now washed and should receive a coat of neatsfoot oil on both sides.

9. Hang up the wet, oiled hides to dry.

10. When dry, stretch until soft. If dry hides are difficult to stretch, sprinkle with water and cover for two days, and again stretch and dry. The hides will remain soft if enough oil is used.

Handling is very important when hides are in the above solutions. To do this work properly, the hides should be removed from the solutions two or three times a day for about five minutes each time.

The hides are generally cut up the back, giving what is known as two sides. This is generally done before removing the hair.

Chrome leather should be suitable for repairs, &c., about a farm.—A. and P. Notes, N.S.W. Dept. Agric.

Why Cream is Second Grade.

Of the various causes of second-grade and "border-line" cream there is none so common as the contamination resulting from inefficient washing of dairy utensils. Contamination may result from—

Failing to wash up twice daily.

Washing up with cold water, either once or twice per day.

Leaving the separator unwashed at night.

Failing to use washing soda to remove grease from utensils.

Using objectionable cloths or unclean brushes for washing up.

Failing to scald thoroughly all utensils, brushes, &c., after washing.

Failing to wash and scald cans on their return from the factory.

Washing up utensils in polluted water—rain water is always preferable.

Hand-reared Pigs.

Mr. A. G. Stewart, proprietor of Strathmore Stud Piggery, Cedar Pocket, near Gympie, recently had the misfortune of having his Large White sow contract mammitis when her litter was born. Mrs. Stewart took an interest in the young pigs, and her experience in rearing the litter should be of interest to pig-raisers.

On the day following the birth of the litter of twelve pigs the sow was found to have completely lost her milk flow, and through her sickness the sow had killed two of the litter. When the remaining ten pigs were two and a-half days old and almost dead from starvation they were taken in hand and fed from a dish a mixture of half whole cow's milk and half water every two hours daily and once through the night. In the meantime Mrs. Stewart sought advice on the feeding, and then altered the diet to half separated milk and half whole milk, with sugar to sweeten. This was when the pigs were four days old.

During the third week the pigs were put on to one and a-half-hourly feeds during the day and one during the night. This was continued until the sixth week, when they were reduced to six feeds daily.

The food was kept half whole milk and half separated milk till the fourth week, when the proportion of separated milk was increased, and by the eighth week they were getting two parts separated milk and one part whole. During the sixth week whole maize grain was given in a hopper, and the pigs made good use of it.

The pigs were allowed to run on grass most of the time, and when they were deprived of this during the seventh week they got diarrhœa and lost their appetites. However, this was remedied by giving access to the grass run and a dose of castor oil to each pig on two consecutive days.

End of 1st week..	10 pigs	weighed	42 lb.—Average weight,	4.2 lb.
End of 2nd week..	10 pigs	weighed	80 lb.—Average weight,	8.0 lb.
End of 3rd week..	10 pigs	weighed	142 lb.—Average weight,	14.2 lb.
End of 4th week..	10 pigs	weighed	200 lb.—Average weight,	20.0 lb.
End of 5th week..	*9 pigs	weighed	240 lb.—Average weight,	26.6 lb.
End of 6th week..	9 pigs	weighed	333 lb.—Average weight,	37.0 lb.
End of 7th week..	9 pigs	weighed	396 lb.—Average weight,	44.0 lb.
End of 8th week..	9 pigs	weighed	459 lb.—Average weight,	51.0 lb.

* One pig died from sorghum poisoning.

The rearing of this litter of pigs is considered a very satisfactory achievement, as very few litters reared by the sow have an average weight of 40 lb. at eight weeks old.—E. J. Shelton, Senior Instructor in Pig Raising.

Hints on Soldering.

The materials necessary for soldering are one or two soldering irons, some sticks of solder, a bottle of muriatic acid (spirits of salts), and a small block of sal ammoniac. A handy container for the fire in which to heat the irons can be made out of an empty benzine tin or oil drum by cutting out the top, punching a few holes in the bottom, and cutting a hole in the side within an inch or so of the bottom, so that the heads of the irons can be passed through into the fire.

To prepare to solder, pour into a bowl (glass or ware—not tin or galvanised-iron) a quantity of the spirits and add a few pieces of zinc to "kill" the liquid. The soldering iron is first heated to a dull red heat, a fair portion of the point is filed clean, and this portion (while the iron is still hot) is rubbed with the sal ammoniac. The clean point is then tinned—that is, coated with solder—and this is of great importance if good work is to be performed later. To tin the iron, run a little solder on to a piece of clean tin, alternately turning its point in the melted solder and dipping it in the killed spirits.

Before using the soldering iron, clean the joint to be soldered, and with the aid of a brush put on a little of the killed spirits. The iron should be hot enough to make the solder run freely, but do not let it get red-hot. Withdraw it from the fire, brush the point with a piece of bagging, and dip it in the prepared spirits; then place the point of the iron on the joint to be soldered and move it slowly along, supplying solder as required by placing the end of the solder stick against the iron near the point. When soldering a loose patch, it will be found convenient to run a drop of solder on to the joint first, then hold the patch firm with the aid of the solder stick while the iron is operated to make the patch firm. The edges of any joints to be soldered should be fitted neatly and closely together, and the solder should run freely and adhere almost as if it were part of the tin.

Scours in Calves—Often Due to Parasitic Worms.

The occurrence of sickness and death among calves accompanied by loss of condition, scouring, and the development of "bottling" under the jaw, should lead to the suspicion that the stock are infested with parasitic worms, and a post-mortem examination of a very sick calf should be made to confirm the diagnosis. Some of the larger worms, such as the wire worm of the stomach, are readily seen, but the smaller parasites are difficult to demonstrate in an examination made in the field. Sometimes, by smearing a little of the stomach content, or the content of the first few feet of the small bowel, on a piece of clean glass or on the hand, the tiny worms will be discovered, but even when the worms are present the owner may not recognise them as parasites. In the case of doubt, skilled assistance should be sought.

Treatment and Prevention.—All the animals in the infested herd should be treated with a reliable remedy, after starving for twenty-four hours. A number of preparations will give good results, but the bluestone and mustard drench is cheap and very satisfactory. This is made up as follows:—

Bluestone crystals (copper sulphate)—8 oz.
Mustard—8 oz.
Water—3 gallons.

The bluestone should be dissolved in the water in an enamel or wooden receptacle. (Do not use iron buckets or kerosene tins.) The mustard is mixed to a smooth paste and then stirred into the bluestone solution. The mixture must be kept stirred, since the mustard will tend to sink to the bottom. The doses are as follows:—

Calf aged 4 months—3 oz.
Calf aged 6 months—4 oz.
Calf aged 9 months—6 oz.
Calf aged 12 months—8 oz.

Necessity for Repeated Treatment.—One treatment will produce some good effect, but it will be necessary to repeat the dosing in a fortnight, and again in a month, to obtain the best results. Where the infestation is heavy, and the stock are constantly reinfesting themselves from the eggs scattered over the pastures, drenching at regular intervals right through the year may be necessary.

If stock have become very low in condition, many may eventually die in spite of the treatment. This is because, although most of the worms have been killed by the medicament, the animals have lost so much vitality that their bodies are unable to build up and restore the tissues damaged as a result of the invasion by the worms. Hence when a diagnosis of worm infestation has been made, it is essential that treatment should be carried out as early as possible.

General Management.—A week after the cattle have been drenched they should, if possible, be removed to other paddocks, so that they will not be as likely to re-infest themselves. The infested paddocks used by the calves might be grazed by adult cattle, these not being so susceptible to the attack of worms. Most of the parasites which infest stock require moisture for their development on the pastures. Hence, low-lying areas which are constantly damp, swampy patches and soakages, are dangerous in that they provide conditions suitable to the hatching of the eggs and the later development of the embryo worms. In districts where worm infestation occurs the young stock should be grazed as far as possible on well drained paddocks.

Frequently the ill effects of worm infestation is most marked in the winter months, when the pasturage is known to be innutritious, and the calves should then be given a daily ration to make up for this lack of nutriment.—A. and P. Notes, N.S.W. Dept. Agric.

Points for Pig Raisers.

Spring pigs are those born during the spring and early summer months of the year. They invariably do well and have a better opportunity with more favourable food supply and better weather than those often spoken of as autumn pigs, which are born ahead of the cooler months of the year when food supplies are on the down grade and lower temperatures prevail. This does not infer that pigs do not develop satisfactorily during cold weather, for some of the best pigs in the world are those produced under harsh conditions in cold countries like Denmark, Sweden, Poland, Lithuania, and other European provinces.

Sunshine, fresh air, and plenty of nutritious foods are much to be desired in the breeding and feeding of stock for profit.

Overseas publications use the term "gilt" and "yelt" quite a lot in discussing pigs. These terms mean the same and apply to the female pig dating from weaning up till the time she produces her first litter. After that the gilt or yelt become fully fledged matrons in the herd and are known as brood sows, breeders, or as sows. The term "hog" invariably applies in this country to the entire male pig used for breeding purposes. The castrated male is known as a "barrow" pig. In America and other countries the term "hog" is used to describe all pigs irrespective of sex. The term "swine" is synonomous with pig—in fact, it is desirable to eliminate the term swine altogether and to use pig in discussing this class of stock and pig industry affairs associated with breeding, feeding, marketing, &c.

In-breeding, or the mating of animals which are too closely related is not advised in the breeding of pigs, as it invariably predisposes to weakness, barrenness, or sterility, and makes the animals more susceptible to diseases like tuberculosis, pneumonia, rickets, &c.

Line-breeding is a system of breeding practised for a special purpose and is a scientific business that should not be attempted by the inexperienced farmer. It is better to use males and females entirely unrelated than to run the risks associated with in-and-in-breeding or neglected breeding generally.

Pigs should not be weaned before they are eight weeks old—i.e., unless the sow suckling them is unable to do her job properly and has an insufficient supply of milk. It is preferable to allow the pigs to suckle the sow till nine or ten weeks of age than to wean before eight weeks, and the males that are to be castrated should be operated on between the age of five and six weeks. This operation should not be deferred till after weaning, as it becomes more risky and more difficult to perform as the animal develops and there is greater loss of time in recovery to normal health again.

When selecting a sow for breeding purposes be careful to make close inspection and see that the selected animal has no fewer than twelve teats. The sow with ten teats might be just as good a breeder or she might not, but it is better to be on the safe side and make twelve to fourteen teats a requirement in selection. In fact, if sows with sixteen teats are available, select them also, provided they are otherwise suitable, for the more young pigs a sow can suckle and rear to weaning age the better it is for the farmer, and unless the sow has the teats she cannot suckle her pigs. The sucking pig usually keeps to the same teat, and if the number of pigs is in excess of the number of good teats the balance of the suckers should be transferred to another sow or be bottle-fed or be destroyed, as it is useless expecting good results if the pigs are unable to suckle together without undue fighting or robbing. Small weakly "runts" rarely pay for keeping, and they often spoil a good litter and irritate a good sow, causing more harm than they are worth.—E. J. Shelton, Senior Instructor in Pig Raising.

A Point in Horse Training.

In farm or road work the fast, even walking horse covers more miles in a day than one of erratic gait. It is not only a pleasure to sit behind a fast walker but saves time. In these days of high costs in every direction, the fast walker, by doing more work in a given time and costing no more to feed or drive is the more profitable animal to keep. The conformation of many horses is such that all the teaching and patience in the world cannot make them walk fast. Nevertheless the walking pace of every horse can be fully developed by careful training.

The treatment the young horse receives when being broken in often spoils the paces. It takes more time and patience to develop a good walking pace than many people are prepared to devote to it. The conformation of some animals is such that they require little teaching. The great fault is that so many men when breaking in a horse urge it too much in the early stages and expect it to go at a regular level pace too soon, with the result that its full measure of pace is never attained.

Too much attention cannot be given to training the young horse to walk well, for it is the foundation of its usefulness. How often has many a splendid goer disappointed his owner the first time he got into heavy pulling by virtually jibbing because he had never been taught to walk in a vehicle. The farm horse's work is done at a walking pace.

Apart from training much can be done towards the improvement by breeding only from mares that walk naturally and putting them to stallions of the right conformation that also walk freely.

Buying Better Boars.

That Queensland farmers have fully appreciated the advantages offered under the Pig Improvement (Better Boar Subsidy) Scheme is evidenced by the success that has attended the scheme initiated towards the end of last year by the Hon. the Minister for Agriculture and Stock (Mr. F. W. Bulcock), under which, on approved boar purchases, a 50 per cent. subsidy refund has been paid to purchasers of Large White and Middle White boars four months old and over, provided the maximum subsidy did not amount to more than £5 5s. The scheme is still in operation, but all future purchases will have to be arranged through the Rural Industries Board of the Agricultural Bank on a basis of the loan of 50 per cent. of the purchase price, repayable over two years.

Under the new conditions Berkshire and Tamworth boars will be included in the scheme as well as Large and Middle Whites, the age of approved boars being between four months and two years.

Full particulars of this scheme may be now obtained, and pig raisers are urged to act immediately if they desire to benefit under this system of purchase. It is of interest to notice that under the subsidy refund scheme Large White and Middle White boars have been distributed over a wide area of the State, including the following districts:—

Western.—Dalby, Komine, Walloon, Square Top, Surat, Warwick, Aubigny, Cushnie, Pinelands, Drillham, Yamsion, South Canning Downs, Miles, Jondaryan, Kiamba, Mitchell, Kupunn, Moore.

Moreton.—Ipswich, Rosevale, Gold Creek, Marburg, Bundamba, Pine Mountain, Minden, Purga, Calvert, Biarra, Fernvale.

South Burnett.—Tingoora, Murgon, Wondai, Cinnibar, Goomeri, Nanango, Cushnie, Wooroolin, Maleny, Kiamba, Mundubbera, Tableland, Brigooda, Booneune, Marumbar, Gueena.

Upper Burnett.—Abercorn, Berajondo, Gayndah, Cannindah, Riverleigh, Biloela, Littlemore, Thangool, Kalaldo.

North Coast.—Bauple, Howard, Builyan, Eerwah Vale, Widgie, Palmwoods, Maleny, Imbi, Mapleton, Kilcoy, Samsonvale, North Arm, Eumundi, Gunalda, Rockhampton, Garden Island, Mount Kilcoy, Mooloolah, Kin Kin, Redcliffe, Lagoon Pocket, Cooroy, Caboolture, Peachester, Zillmere.

South Coast.—Rathdowney, Ormeau, Currumbin, Sprinbrook, West Burleigh, Beenleigh, Gleneagle, Maroon, Cotswold, Upper Coomera, Hillview, Lindum, Jimboomba.

Northern.—Innisfail, Bambaroo, Ingham, Malanda, Delta, Millaa Millaa, Manton, Peeramon.

Practically the whole of the animals selected were bred in this State, thus reducing transit expenses and giving additional encouragement to Queensland breeders of the type required.

It is pleasing to know that the stimulus thus given to the purchase of better boars has resulted in a widespread demand for boars in the two other principal breeds not previously included in the scheme, but now provided for by the Rural Assistance Board's Scheme.

At no previous period in the history of the stud pig breeding business has there been such excellent demand and sales, although the range of values has been lower than for three or four years past when pig prices generally were higher. In fact, the position has improved to such an extent that several breeders report having sold all the available stud animals, and orders have been placed by them covering the purchase of additional breeding stock.

Breeders of Tamworths and Berkshires have also benefited to an extent not previously anticipated, and prospects for the future are bright.

Application forms and all information in connection with the new scheme may be obtained from the Rural Assistance Board, Agricultural Bank, Brisbane, or through the Department of Agriculture and Stock.

"Choicest" should be only Grade of Dairy Product.

There should be only one grade of dairy product—namely, "choicest"—and the attainment of this ideal depended largely on cleanliness and good management on the farm. That was the kernel of an address by Mr. J. B. Timbs, manager of Bowthorne Butter Factory, at the recent Hunter River and Lower North Coast Conference of the Agricultural Bureau of New South Wales. In many cases, continued Mr. Timbs, the fault for products being graded lower was with the farmer, and the result was a loss to the industry.

While it was necessary for the farmer to have a good herd to obtain choicest dairy produce, there were many matters connected with the management and treatment of the animals which also had considerable influence on quality. Any cause of over-heating, for example, detracted from the value of the milk. A cow bulling, a cow chased by dogs, or one brought quickly from a lucerne paddock to avoid "bloat," might cause 50 gallons of milk to be put out when the "blue test" was applied.

Milk that was really clean could be kept for days—and even months—but as the result of the action of bacteria the quality was lowered. These organisms entered milk from the atmosphere and from dirty surroundings. In winter they did not develop as rapidly as in summer, for a temperature of over 50 degrees was more favourable for their increase. One bacteria might divide into two in twenty minutes, four in forty minutes, and each of this rapidly increasing number had to be fed on the sugars in the milk. If dirty conditions obtained anywhere in the dairy there would be millions of bacteria to start with, and after four or five hours on the road the milk would be thrown out when it reached the factory. Dusty yards were a prolific source of bacteria.

One of the things necessary to ensure that milk was kept clean was that the water used for washing the hands when milking must be clean. On the average farm the same water was used many times—sometimes as many as fifty if that number of cows was milked. The problem of the convenient supply of clean water for this purpose was a real one on many farms, but Mr. Timbs suggested hanging a 4 or 5 gallon container fitted with a brass tap between each two bails—a milk can past use for milk would do—and filling these before milking so that a supply of clean running water would be available for rinsing, not only the hands, but also the cloths used to wipe the udders after each cow. The careful wiping of each cow's udder was essential, for the udder was a very definite source of bacterial infection.

Many dairy farmers who washed their hands with care and who were particular as to the condition of the udders and even the cloths used to wipe them, failed to realise that contact of their hands with the milking stool—which probably had not been washed in its lifetime—could be the cause of millions of bacteria entering the bucket, while the handling of the bail release stick was another prolific source of bacterial infection.

It was necessary, also, that cracks in the floor of the bails be repaired, otherwise there would be accumulations of urine and milk which it would be impossible to clean. Repair work consisted of excavating the crack and filling with a cement grout.

An efficient system of cleansing dairy utensils in the milk room was a necessity The proper system was cold water, hot water and "elbow grease," and then *boiling* water. The most usual fault in regard to cleansing was that the water was boiled elsewhere than at the dairy, while a common practice was to pour the water from one can to the other till it was often quite cool. The best method was to pour, say, ½ gallon of boiling water into each, put the lid on for a few minutes, and then stand them on an iron bench inside the milk room. Wooden benches became impregnated with bacteria.

Time to Plant Trees—Their Value on the Farm.

Though their claims are so generally neglected, trees serve many important purposes in farming and pastoral areas. They may be usefully employed in the following ways:—

As windbreaks and shelter belts.

As isolated or scattered shade or shelter trees.

As a reserve supply of fodder for periods of drought.

As tree plantations to supply the timber and fuel requirements of the farm, in addition to providing a source of revenue by the sale of products.

As screens around dams and tanks to prevent silting up by dust and undue evaporation of the water contents.

As a means of preventing erosion on slopes and along the banks of creeks and rivers.

As a means of enriching worn-out or poor land.

As ornamental trees in improving the appearance of the homestead.

As bee trees.

Generally speaking, May to August are the best months for tree-planting.

Berkshire Pigs—Evolution Traced—Special Characteristics.

Trace back the history of the Berkshire and you will find that this breed has been recognised as distinct for more than a century. It is probably that, as well as the fact that these pigs have been consistently developed for their commercial characteristics, which accounts for their wonderful record.

"The Grazier," dated 1808, published a brief article on the breed, and also a print of two Berkshires exhibited at a cattle show in 1807. During the first half of the eighteenth century their principal home was among the small woods on the downs in the west of Berkshire. From there they were taken in droves by road to Oxford, Reading, and other markets. The first exportation of Berkshires was in 1825, when a settler took several head to the United States.

About the middle of the last century the colour of the breed was black and white, with a preponderance of the former. The origin of the present black body and white extremities was a friendly rivalry between breeders who attempted to get rid of the white hair on the body. Their efforts met with such success that, as early as 1856, a first-prize pen was described as: "Colour mostly black, with white legs and tails, and a few splashes of white about the body."

By 1869 the markings as we know them to-day were general in the best herds, except that small patches of white hair were allowed on the lower parts of the shoulder. In 1847 the shape of the snout was moderately dished, long, and fairly pointed. The first pedigree record for Berkshires is dated 1859, while the first volume of the Herd Book was issued in 1885 from a collection of records made by Mr. Heber Humfrey (1859-1904), one of the most prominent of pioneers, breeders, exhibitors, and judges of that day.

In the specification of the breed it is stated that the general character of the animal should indicate type, quality, and breeding. Boars should have a masculine appearance, sows a feminine one. The head should be moderately short, the face dished, and the snout broad. Width between the eyes and ears is desirable. Ears should be fairly large, carried erect or slightly inclined forward, and fringed with fine hair. The jowl ought to be light.

A good neck is fine, evenly set on shoulders, and free from wrinkles. Shoulder blades, too, should be fine and well sloping. Special attention is given to this characteristic in females. The legs should be short, straight, and strong, set wide apart, and standing well on toes. The animal should walk well. The back should be long and level, with the tail set high. Sides should be long and deep, the ribs well sprung. Broad hams, wide and deep to the hocks are desirable.

The belly should be thick with a straight underline. Depth through the heart is required. Both males and females should possess well-developed bone. The flesh should be firm without excessive fat, the skin fine and free from wrinkles, and the hair long, fine, and plentiful. Manes are undesirable, particularly in females. The colour should be black, with white on the face, feet, and tip of the tail. A crooked jaw and a rose back are both regarded as definite imperfections.—"The Weekly Times."

Paper Mulch for Pineapples.

From time to time encouraging reports concerning the use of paper mulches in horticulture have been received from overseas. In Hawaii the practice has become an important one in commercial pineapple growing. In 1930 Sydney firms handling lines of special mulch papers from America made available to the Department of Agriculture supplies for experimental purposes, and during the last three years trials with pineapples have been carried out at Grafton Experiment Farm.

A report of these trials in the current "Agricultural Gazette" of New South Wales summarises the results as follows:—

(1) A paper mulch in a dry season greatly aids in keeping the soil moist and in good condition, and enables the plant to make fuller use of the richer top layer of soil.

(2) Paper mulched plants flower and mature their fruit two to three weeks earlier than those receiving ordinary cultivation.

(3) The paper mulched plants are more productive, and their fruits larger and of better quality.

(4) Paper mulching effects a considerable saving of time in cultivation, only occasional hand weeding being necessary as opposed to frequent cultivation in the case of plants unmulched.

(5) With careful use the paper mulch should last several seasons; in the case of annual crops it is rolled up and put away at the end of each season.

The Meat Export Industry.

In an address on "The Past, Present, and Future of Australia's Meat Export Industry," at a recent meeting of the Hawkesbury Agricultural College Branch of the Agricultural Bureau of New South Wales, Mr. J. B. Cramsie, ex-chairman of the Meat Industry Board, said most old cattle men thought our cattle were the world's best, and this was the stumbling-block to Australia's meat export trade. Our cattle were not in any way the best, and, in fact, generally had depreciated since the war. This was mainly due to the use of the scrub bull and to deterioration in our grass lands. After travelling in every meat-producing country in the world, and thirty-five years in the industry, however, he was sure Australia could produce as good a quality meat as any other country, and more cheaply.

Australia exported only frozen meat, and her freezing works were the best in the world, but it must be definitely understood that these plants were not in any way suited for chilling beef. In the chilling of beef we had lagged behind Argentine, New Zealand, and other countries. Australia should follow Argentine and Uruguay, who forty years ago were producing as rough a type of cattle as was possible. By buying the best English bulls, however, Argentine now produced excellent meat, which was readily sold in Great Britain. Uruguay had proved the value of pasture improvement. That country was only half the size of Victoria, and yet it owned 9,000,000 cattle and 20,000,000 sheep. The best exotic grasses were introduced, and Uruguay now produced the best baby beef.

The scrub bull was a greater curse in Australia than the rabbit or prickly-pear, for it was through the use of scrub animals that Australia's beef had deteriorated so much. Of the bulls in use, 75 per cent. should be destroyed. He was a strong advocate of a "Scrub Bull Act." Argentine to-day had few bulls worth less than £40 per head, and it was because of these that her beef was so much sought after.

In regard to the Northern Territory, Mr. Cramsie said there was not one station there which had paddocks to put young growing females in. Consequently, the animals were bred too early, being thus ruined, and the steers produced were poor. Thus little hope was entertained for the Territory as an export meat producer.

Australia had had too many natural favours, and we had not learnt better methods from adversity. We stored little fodder, and failed to improve our pastures, so that when droughts occurred stock losses were enormous. New South Wales, for instance, had lost over 75,000,000 sheep from these causes, and in one drought (in 1919-20) 10,500,000 sheep perished.

If Australia was to enter the fat lamb trade successfully, then she must (1) improve pastures; (2) select only the best ewes; (3) use the best ram that money could buy. In regard to the ewes, there was no need to interfere with the wool side, and Australia's name for wool could be maintained while making a market for fat lambs. The use of a good sire was very important, as often he was responsible for 75 per cent. of the characteristics in the progeny. The motto for fat lamb producers should be "Breed the best and feed the best."

Australia must follow the agrostologist more closely to-day. With proper improvement and management of pastures we could carry three times our present number of cattle.

He was definitely in favour of country killing when properly organised. Individual centres could not hope to be successful with country killing, as there would be much opposition from vested interests, and they could not arrange for shipment successfully. There was no reason why sheep and cattle for meat export should be brought to Sydney for slaughter. This resulted in 1s. for loss in weight and quality of carcass, and 1s. in extra freight per sheep. Werris Creek could be made a country killing centre for the northern part of the State, Orange for the central part, and Cootamundra for the southern part. A great deal of organisation would be necessary to arrange for cold stores, shipping facilities, and marketing.

The only solution to the beef industry, said the speaker in conclusion, was the chilling of meat. Only a relatively low percentage of the cattle slaughtered, however, was suitable for chilled beef.

Turning Wheat into Wool.

In an address at the recent South-Western District Conference of the Agricultural Bureau of New South Wales, Mr. D. Kelly, of Quandialla, advocated placing 100 acres of a 200-acre holding under wheat, and for comparative purposes growing hay and running sheep on the other half. Costs were considered and figures quoted to show that the net return would be much greater from the area running 1,000 sheep as against the equal area on which wheat was grown. The figures given were:—

Wheat—

100 acres sown; 14 bus. crop (district average) at 2s. 10d. bus. = £200.

Hay and Sheep—

100 acres sown; 1¼ tons crop (district average) = 125 tons.

1¼ tons hay at daily ration of 1 lb. chaff per sheep would feed 10 sheep for a year. 10 lb. wool per sheep at 1s. lb. = 10s. sheep.

Therefore 1,000 sheep would give return of £500.

Header and binder costs would nearly balance, and cutting and handling hay would equal carting wheat to rail.

The loss of sheep (say 5 per cent.) would equal £50, and shearing, say, £20.

Allowing for other incidental expenses, Mr. Kelly submitted that there ought to be a substantial balance in favour of the hay and sheep project; he intimated that it was his intention to try such an experiment next year on four times the scale referred to.

Points in Rearing Calves.

Always handle calves quietly and patiently.

Feed at regular times each day and in regular quantities.

Feed only clean sweet milk—the calf is not designed to assimilate any other. Add some constituent to replace the feed value of the cream removed from the milk, and lime-water to assist digestion. Milk should be pasteurised if possible, and on no account should the froth be given to calves.

Feed the milk at body temperature. Cold milk requires a great deal of the animal's energy to heat it up to a point at which digestion can take place.

Cleanse feeding buckets as carefully as you would all other dairy utensils.

Keep the yard and its surroundings free of manure and rubbish. Such material breeds flies, and flies are active carriers of disease.

Provide shade in summer, and shelter from winter wind and rain. It is cheaper to conserve animal energy in this manner than by the use of larger amounts of food.

Always pick up any pieces of rag, paper, twine, &c., found about the calf paddock—young calves, like other young animals, are not discriminating in their diet.

Provide a suitable lick consisting of salt and bonemeal.

Marketing the Citrus Crop.

Good fruit is worthy of careful marketing, and he is a short-sighted orchardist who for want of a little final trouble jeopardises the chance of good prices for the product to which his whole year's work has been devoted. The reminder is seasonable for the citrus grower, whose attention is directed to the following important points:—

Exercise extreme care in packing.

Place fruit carefully in picking bags.

Carefully transfer fruit from picking bag to box.

See that the box has no protruding nails or splinters.

Do not jolt the fruit over rough roads.

Grade carefully for size and quality.

See that the sizing machine is functioning properly.

Use a clean case.

Pack neatly and tightly, but do not squeeze or jam fruit into boxes.

Stack cases on sides.

Herd Testing—A Woman's Viewpoint.

"A Dairy Farmeress" writes (9th July, 1934):—

"I have yet to thank you for the record of last season's results of the testing of my small herd. In some ways the results were a surprise, though in others they simply bore out my own opinion of my cows. I liked the testing—it added the factor of intelligent interest to an otherwise distasteful task, and also it gave me the opportunity of saying, 'I told you so,' on three separate counts.

"I am sending in to-morrow to request the factory manager to forward the testing bottles to start the new season's testing—some of my cows have young calves now, when their last year's calves are only eleven months old. I want to get the full period in this year.

"In your letter of 20th April (34/182), you say, 'It is hard to realise why so comparatively few dairy farmers, &c. . . .' In one issue of the 'Agricultural Journal' the same wonder is expressed and the opinion put forward that, as the free testing scheme has been in operation for so long, farmers' apathy can hardly be due to ignorance. Well, I'd like to say that, as far as my experience goes, you are wrong. I, myself, though brought up on the land, have not long been a dairy farmeress in my own right, and, though I knew there was a scheme of some sort, and believed in testing in theory, I knew nothing of the details. My nextdoor neighbour, recently moved in, has been dairying for years and knew nothing of it, and my neighbour on another boundary was equally in the dark.

"Neither of these people take the 'Agricultural Journal,' and were amazed when I told them the slight expense they'd have to incur to get it.

"The reason for their apathy is not far to seek. They regard dairying merely as a sideline—something 'the wife and kids' can fill up time with, something they themselves give a hand with when they have nothing more congenial to do. The real interest of these men lies in beef cattle. They do not as a rule buy real dairy stock. They just milk the best they can get out of their herds. The overburdened wife can be forgiven for not testing. It takes up time she ought to be spending darning the socks; and the children, poor little things, loathe milking like poison.

"Other men think they can pick a milker on appearances. One old fellow told me seriously the other day that 'the longer a cow's horns, the more milk she will give,' and also that 'you never find a tough cow a bad one'—a piece of fatalism that 'gave me to laugh,' for I was milking the toughest brute in our yard, and last season Babcock placed her at the bottom of the list. So you see?

"Last year my herd at no time numbered more than fifteen. I have fourteen in now, ten of them going on test now. By Christmas I expect to be doing between forty and sixty, and I want to test all but the obviously useless.

"I am very glad to have the facilities for testing that the Department of Agriculture offers."

Kerosene Emulsion—Its Preparation and Use.

As a general spray for scale insects on citrus and deciduous fruit trees kerosene emulsion has been largely superseded by miscible white or red oil. It can still be recommended, however, for the control of thrips and for fowl tick, fowl mites, fleas, and other vermin, states a departmental leaflet. The formula is as follows:—

Hard soap, ½ lb.
Kerosene, 1 gallon.
Water, 1 gallon.

Cut up the soap and place it in 1 gallon of water and heat until dissolved. Remove from the fire and immediately stir in the kerosene and mix until thoroughly emulsified.

For the control of thrips, aphids, &c., add this stock solution to 18 gallons of soft water (1 pint stock to 9 pints water). For fowl tick, fowl mite, and fleas, the stock solution should be added to 8 gallons of water (2 pints stock to 8 pints water). The stock solution may be diluted at once with cold water, but if allowed to stand until cold it must either be reheated or else hot water must be used to dilute it.

As kerosene is injurious to rubber, a warm solution of soda should be passed through the hose after using.

Water-storing Trees—Nature's Living Reservoirs.

Our Australian aborigines have long known that certain species of native trees are natural reservoirs containing, in some instances, quite considerable quantities of water. In the arid inland districts, and during prolonged periods of drought, it is evident such knowledge must be of great value.

Many smaller plants, such as the pigface, cactus, and the ice-plant (common along the Balonne River) conserve a proportionately tremendous quantity of water; and succulent epiphytes like orchids are capable of flourishing luxuriantly on bare rock by their ability to absorb water from moist atmosphere. Though the water-holding capacity of species such as the bottle-trees and coolibah is well known, numerous numbers of the eucalyptus family, besides the coolibah, come under this category. The list includes various species of stringy-bark, the Grey ironbark (*E. paniculata*), the popular box (*E. populifolia*), also called "Bimbil," and shiny-leaved box, the Morrel (*E. o'eosa*), and at least five species of the mallees. Of the latter, the yellow or water-mallee, is perhaps the best known. The western bloodwood (*E. terminalis*) I should also have mentioned. There are, in addition to all these, the desert oak (*Hakea Grevillea striata*) and the needle-bush (*H. leucoptera*). Of the Casuarina family, *C. Deccaiscuana* is another example, and several kinds of acacia are also known which store up water in excess of the average amount. In South Queensland scrubs several members of the grape-vine family (Vitis) are quite notable, and probably *V. antarctica* and *V. hypoglanca* are the most common. When chopped into short lengths, these vines exude a surprising quantity of quite wholesome water.—P.J.B. in the "Sydney Morning Herald."

Control of Bracken Fern—Value of Kikuyu Grass.

Because of its smothering effect on all other plants in a pasture, Kikuyu grass has been found of considerable value in the control of bracken fern.

The fern country on which it is intended to grow Kikuyu should be ploughed and worked prior to planting in the spring, or if the soil be of an open, free nature the fern fronds should be cut in the early spring, burnt, and the grass roots hoed in. On large areas drills 3 feet apart should be struck out with a single furrow plough, the Kikuyu being dropped every 3 feet in the bottom of the drill, and covered with a light furrow, or by running a harrow along the drills in the direction in which they run. If the weather is at all favourable the Kikuyu grass makes headway as soon as, or before, the fern, and by winter there is only sufficient fern showing to protect the grass from frost. By the following spring a mat of grass has formed over the blank spaces, and the fern is gradually choked out.

This grass provides excellent quality feed, and although mainly a summer grower it withstands dry conditions better, remains greener for a longer period, and provides a greater bulk of feed during the winter months than does Paspalum. Kikuyu is particularly useful for planting on hillsides, as it binds the soil together, and thus prevents washing of the surface soil.

In very cold districts its growth period is limited to a few months of the year; consequently successful results can only be looked for in areas where the rainfall is fairly plentiful, and where a long warm growth period is possible.—A and P. Notes, N.S.W. Dept. Agriculture.

Animal Health Station Commended.

A North Coast correspondent writes (23rd June, 1934):—"Please accept my very best thanks for the help I have received from your station (Animal Health Station, Yeerongpilly). Some months ago I wrote to you regarding a cow with a bleeding lump in the ear. The cow was most distressed and could not chew the cud with comfort. In her irritation she would rub the ear, causing it to bleed most alarmingly. Your advice was to place spirit (rectified) in the ear and paint the lump with liquor Iodi. fort. 1-6. The result was most magical. Not only was there improvement from the first day, but after a few weeks the lump, which was as big as half a hen's egg, completely disappeared, and the cow calved normally, and is now milking well. For a cure like that one would willingly pay a good many "bull taxes." It is a great comfort to know that your body of experts at Yeerongpilly are working day and night for the benefit of us dairy farmers, and it can only be very ignorant people who object to paying a small contribution to help things along."

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

ILL-NOURISHED CHILDREN.

POORLY nourished children may be seen by the skilled observer wherever he goes, says the monthly article issued by the Queensland Baby Clinics for the guidance of those who have the welfare and care of young children. Fortunately they are usually fewer in number than the well-nourished children, but there are many of them.

Their number varies in different places and at different times, but they are always present. There are many causes of poor nutrition, but in all but a few the cause is simply defective diets. By this we do not mean that the children do not get enough food. They probably get as much as they will eat; they may even get expensive foods, but they do not get the right sort of food. Their mothers have never received a right education, and are not to be blamed for want of knowledge which no one has taught them. They are not to be blamed, but their children suffer all the same.

Want of Knowledge.

There is a widespread belief that the important foods are meat, white bread, butter, and sugar, and that all other foods are extras. Of the five necessary vitamins meat contains only one, white bread and sugar contain none, and butter, which is valuable for its vitamins, is expensive, and is being replaced by margarine. So long as times are good most people take a large variety of foods, and these often supply all that is needed in the diet. But when times are bad and thousands are on relief wages, it is only natural that mothers should concentrate on what they think the important foods. They satisfy their children's appetites with foods on which really good health is impossible. There is no starvation, but much bad feeding. Poverty is not the cause. The cause is want of knowledge, the evil effects of which are made more dangerous by want of money. The foods that are essential to children's health are only too often cut out because the mother thinks they are not important, and therefore she cannot afford to buy them. Meanwhile she spends money unnecessarily on foods of inferior value.

Milk is Necessary.

The most important of foods for children is milk, and this is often the first to be cut out. In some places poorly-nourished children have become very numerous. It is sad to see so many of the next generation being spoilt in the making—so many that will never grow strong men and women, but will help to fill our hospitals, when in later life they fall victims to all kinds of diseases—so many that will fall easy victims to tuberculosis, or become hopelessly crippled with chronic

rheumatism. The condition of their teeth will be such that all the dentists in Queensland working overtime, Sundays and holidays included, will not be able to do what is necessary. Every child under six should have a pint of good milk in some form or another daily. Every child over six should have at least half a pint, but a whole pint would be better. As it is, many families are given only a little condensed milk, or some powdered skimmed milk, in large quantites of water—a mere pretence of proper nourishment.

What can we propose for this great evil? Firstly, we must dispel this want of knowledge. Our Infant Welfare Service is responsible for all children under school age, and is doing its best to help their mothers. This work is difficult and slow, and we cannot reach mothers not within easy distance of our centres. A large number of new branch clinics are much needed. The next generation of mothers will, we hope, have been better educated before they leave school. Secondly, there are ways in which we can directly encourage the increased consumption of milk. These will be explained in our next article.

HONEY—A FOOD AND A MEDICINE.

Mr. H. Willoughby Lance, Apicu'turist, Department of Agricu'ture, West Australia, writing in the current "Journal of Agriculture," W.A., says, inter alia:—

THE human body requires a great variety of substances for its growth, maintenance, and development. The food required by growing children is much the same for all, but the food necessary for the maintenance and development of the adult may vary, according to the class of work engaged upon.

Certain classes of food are, however, required by humans of all ages, no matter what their occupation may be. One of the most important of these is the hydrocarbon group, and one of the commonest of this group is sugar. Sugar is commonly produced from the ground by growing vegetable matter. The commonest form of sugar known is that produced from the sugar-cane, and is to be found in practically every household in Australia. In European countries a large amount of household sugar is manufactured from the sugar beet. Both these sugars, however, are manufactured articles; that is to say, they are not in their natural state; they have been extracted from the cane or beet and gone through certain processes known as refining during which everything that is not plain sugar is removed.

The sugar contained in fruit and honey is just as Nature provides it and is in conjunction with certain acids and mineral salts which the body requires.

Chemically, there are three principal sugars contained in honey:—cane sugar (sucrose), grape sugar (dextrose), and fruit sugar (levulose), the last two together being called "invert sugar"—that in plain words mean that it has been inverted or changed. Cane sugar (sucrose) requires to be changed before it can be used by the human body; invert sugar has been changed and is ready for assimilation by the blood stream almost immediately it has been passed into the stomach. The sugar on our breakfast and tea tables is pure sucrose and must be acted upon by the secretions of the stomach and inverted before it can be passed into the blood stream.

Honey contains less than 2 per cent. of sucrose, and often practically none, and from 75 per cent. to 85 per cent. of invert sugar. It will thus be realised that the sugar in honey requires practically no effort to digest and the human body obtains the full benefit of the carbohydrate food. Carbohydrate foods are classed as fuel foods which supply the body with the energy needed for the various tasks it performs, rather than those whose function it is to build and repair the body. In addition to sugar, honey contains volatile oils which give it its aroma and flavour, and indicate to a large extent the plant from which it has been obtained; also a small amount of mineral matter, including magnesia, iron, calcium, phosphorous, &c. In this respect it differs from white household sugar, from which the mineral substances originally present in the plant juices have been removed by the refining process. Although the amount of these mineral substances in honey is not high, their presence must not be disregarded, as in many of the present-day foods they are entirely lacking.

As mentioned previously, honey contains both dextrose and levulose sugars, and it depends on the proportion of these and their relation to the percentage of water as to whether the honey granulates or crystallises solid, or only becomes thick, or whether a portion is solid and a portion liquid. The dextrose sugar granulates but the levulose does not. When the honey has a solid appearance all through, the levulose or fruit sugar fills in the spaces between the granules and is usually small in proportion; when part is granulated and part liquid, the levulose is greater in proportion.

Any honey that has granulated may be made liquid again by immersing the jar in water and raising it to a temperature not higher than 140 degrees F., that is to say, not hotter than one's hand can stand. The jar should not come in contact with the bottom of the vessel containing the hot water, but should stand on a piece of wood placed therein.

The value of honey is the same whether liquid or granulated—it is only a physical change that has taken place.

Another important value of honey is its inability to carry germs of any disease that attack the human frame, being self sterilising. The reason for this is that it is hygroscopic, that is to say, it attracts moisture to itself. All life contains water, even the smallest disease germ contains moisture, and if this is removed, it dies. Any germs, therefore, that may find their way into honey are destroyed by having their moisture taken from them by the honey. This is an important fact, which it is not belived applies to any other food.

Dr. Henry Lindlaker, in his Vegetarian Cookery Book, writes:—"Always the natural sugars should be used. Honey is the very best of all and should be given preference when available. Maple and pure cane syrup come next in order, then the brown unrefined cane or beet sugar. The highly refined inorganic sugars, powdered, and loaf sugars should not be used."

Sir Arbuthnot Lane, a physician on the staff of the Lady Margaret Hospital, London, in a booklet entitled "Honey for Health," says that "Honey is a food full of energy and therefore stands high as a producer of stamina and strength. Those who add honey to their daily diet may be assured that they are adding to their capacity to work with hands and brain. If every traveller would ask at his hotel for honey with his porridge or cereal foods, he would be far more fit to tackle the day's work. Honey has practically no waste matter in it. Extracted honey is one of the few foods that is all food, and is easily digested." He further goes on to say, "Where people are below par or depressed, where there is chronic constipation with absorbent poisoning, and in children's ailments, honey is a great panacea."

Another important use of honey is for cookery purposes in the place of sugar. In early days before the introduction of sugar, honey was practically the only method of sweetening known. In many countries to-day it is coming into its own for cooking purposes and is no longer a luxury. The twentieth century homemaker is dressing salads with honey, is flavouring tea fancies and cakes with honey, is baking ham for dinner with honey, and surprising evening guests with tasty honey nut sandwiches and delicious fancy cakes and biscuits made with honey.

In using honey for cooking it must be remembered that good honey contains about 17 per cent. water; therefore in mixing, less water will be required than with sugar; also that a cup of honey is heavier than one of sugar; that a cup of honey weighs 12 ounces and sugar 7 ounces, the weight of the sugar in the cup of honey being 9½ ounces as against 7 ounces in the cup of sugar.

One of the advantages of using honey in cakes is that they will keep moist for a very long period, and in fact are improved by keeping.

There are many kinds of honey in the shops, and a large number of people judge honey by its colour and perhaps mild flavour. This is a great mistake. Honey should not be judged by colour, but by its food value and flavour. The darker honeys have been proved by analysis to have a better food value generally than the lighter ones. Some of them certainly do not have an attractive flavour, but this can also be said of many of the light ones.

It is, however, largely a matter of use, and consumers are advised to accustom themselves to a medium coloured honey of heavy body. Thin honeys contain an excessive amount of water and are liable to ferment.

Summarised, the value of honey may be placed under six headings:—

It is the only natural sweetening substance on the market.

It has already been changed or digested by the bees, and is almost immediately passed into the blood stream.

It is an energy producing food.

It contains mineral and other substances, so necessary for the maintenance of health.

It cannot carry disease harmful to human beings.

It is pleasant and attractive to the taste.

The value of the regular use of honey as an article of daily diet cannot be overestimated. In addition to this it has an important value as a medicine. Doctors in Europe and America now recognise this, and use it in their regular practice. It is not used in prescriptions on account of its power to counteract disagreeable flavours, but on account of its healing and soothing qualities. It is a well known cure for colds on the chest, influenza, sore throat, &c., taken with hot milk or lemon.

As a cure for constipation a dessertspoonful in a glass of hot water night and morning will nearly always cure this trouble.

Being antiseptic and drawing, it is a wonderful remedy for boils, carbuncles, septic poisoning, and is used by many doctors in prescriptions for pastes for these diseases, making lancing or cutting unnecessary except in late treatment or very severe cases. A simple paste for this purpose may be made with a dense honey; preferably dark coloured, as this contains more iron and tannic acid; mixed with flour, applied to the place on a piece of lint and covered with oiled silk or jaconet and renewed two or three times a day. This has a powerful drawing action and will cause the rupture or opening of the skin, allowing the pus to drain out, and there will be no scar left. The writer has personal proof of the efficiency of this treatment in the case of severe septic poisoning. Boils are usually relieved in a few days, but carbuncles, being more persistent, may take weeks of treatment.

Similar treatment to the above is excellent for burns and scalds, and is also a cure for piles.

The following is an extract in regard to the use of honey as a cure for toothache:—"It is my honest opinion that no living person knows the therapeutic value of honey. How many persons know that is it a wonder remedy for toothache, even where one is suffering from an abscess. Just take a big swallow in the mouth and hold around the affected tooth for a while. It usually does the trick in a few minutes. I have never known it fail. I have sold numbers of people honey for this specific purpose and everyone of them, without exception, has told me that it worked like a charm." (Emmett Baxter, Philadelphia.)

Honey is also an excellent cure for bee stings, especially if applied as a paste and covered up. For frost bites on ears, fingers, &c., apply honey or honey flour paste and wrap up.

For inflamed and sore eyes, a drop or two or liquid honey put in the eyes several times has been known to bring wonderful results, when all else has failed.

Equal parts of honey and cream mixed together is an excellent cosmetic, softening and beautifying the skin, and is said to be a good remedy for freckles.

A splendid candy for colds, coughs, &c., can be made as follows:—Boil a strong solution of horehound leaves in soft water, strain through muslin, add as much honey as desired, boil until all the water evaporates, pour in shallow vessel, and allow to set.

THE KITCHEN GARDEN

To grow cabbages well plenty of manure should be used. There is no manure to which this crop responds so well as animal. For heavy lands horse manure, and for light soils cow or pig are respectively the best when they can be obtained. If the soil is of a poor quality, dig the ground two spits deep, and put a good layer of manure between the two spits. This is especially necessary in the case of autumn or summer crops, which have to stand a dry spell. Spring cabbage—that is, those that are planted in the autumn for use in the spring—do well if planted on ground that has been well worked and manured previously for peas or onions, and on such ground cabbages can be planted without any fresh manure being added. Of other manures lime is an important factor in successful cabbage culture; it is chemically and mechanically beneficial to the soil and the cabbage tuber. It should be applied at the rate of about 2 lb. to the square yard, and is particularly necessary to heavy soils and those rich in humus. Superphosphate at the rate of 2 oz. to the square yard is good, but should not be applied at the same time as lime or to soils that are infected with club root. When the crop is nicely established, apply 1 oz. of sulphate of ammonia to heavy, damp land, or 1 oz. of nitrate of soda per square yard in the case of light or sandy soil. Nitrate of soda is a splendid fertilizer for the cabbage family. When especially

fine heads are required, water the plants once or twice during the growing season with the following mixture:—1 oz. of iron sulphate and 2 oz. of sulphate of ammonia dissolved in 1 gallon of water.

Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of this, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be a great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly-dug beds. What the action of salt is is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile and causes hardpan to form. French or kidney beans may now be sown in all parts of the State. The Lima bean delights in the hottest weather. Sow the dwarf kinds in drills 3 ft. apart and 18 in. between the plants, and the climbing sorts 6 ft. each way. Sow Guada beans, providing a trellis for them to climb on later. Sow cucumbers, melons, marrows, and squash at once. If they are troubled by the red beetle, spray with Paris green or London purple. In cool districts peas and even some beetroot may be sown. Set out egg plants in rows 4 ft. apart. Plant out tomatoes 3½ ft. each way, and train them to a single stem, either on stakes, trellis, or wire netting. Plant out rosellas. Sow mustard and cress, spinach, lettuce, vegetable marrows, custard marrows, parsnips, carrots, chicory, eschalots, cabbage, radishes, kohl-rabi, &c. These will prove satisfactory provided the ground is well worked, kept clean, and that water, manure, and, where required, shade are provided.

Fresh vegetables, especially vegetables containing vitamins, are essential to good, robust health, and medical men are now advising people to "eat more vegetables."

The growing of vegetables not only means a saving of money, but educates the children by inculcating a desire to have their own gardens in later life, and so help to keep down the costs of living.

Vegetable-growing is not only a healthy occupation, but it also provides exercise and recreation. In the suburbs it has a tendency to keep young people contented at home, and to trouble less about going to horse races and places of gambling. With country people who, perhaps, are less in need of exercise, gardening is a delightful hobby.

It enables private gardeners to improve the strains of vegetables by a careful selection of seed, much in the same way that a flockmaster improves his sheep; and much satisfaction, and, not unusually, generous reward, are to be gained from this work.

The home garden enables the testing out, in a small way, of the newer varieties of vegetables, which work is not always possible, or, if it is possible, not payable with the professional or commercial gardener. The amateur gardener will find this work both fascinating and health-giving.

Given suitable soil conditions, the various culinary herbs (sage, thyme, marjoram, mint, &c.) are easily cultivated in Queensland, and every garden should have at least sufficient plants for home requirements. Commercial production, too, presents possibilities, especially of those herbs which are sold in a green state, the chief of which are mint and parsley. During the winter months a demand exists for both these herbs. Under cool conditions little growth is made, and some growers have therefore resorted to production under glass, especially in the case of parsley. The increased popularity of peas as a vegetable has tended to the more extensive use of mint at all seasons of the year. Owing to the necessity for freshness in the product, the metropolitan market for mint and parsley is supplied by suburban growers.

There is some household demand for dried herbs, which are used also by butchers for the flavouring of sausages. The consumption is very limited, however, and those contemplating commercial production are therefore advised first to make sure of a market for their produce.

For the successful cultivation of herbs a rich, loamy, friable soil is necessary, and a plentiful supply of water must be available during their growing period. Wherever possible, the soil should be dug to a depth of 9 to 10 inches and should be well supplied with well-decomposed stable manure. As the seeds of all these herbs are fairly small, it is necessary to cultivate the soil to a fine tilth.

The Care of the Eyes in Western Queensland.

The subjoined notes on this important subject are by Dr. L. St. Vincent Welch, Chief Medical Officer of Schools, and are published by authority of the Hon. F. A. Cooper, Minister for Public Instruction.

Two Common Eye Diseases.

Certain diseases of the conjunctiva, or moist surface of the eyes and eyelids, are more prevalent in Western Queensland than in the districts nearer the coast. Of several diseases the chief are—

1. Acute conjunctivitis, often known as "blight," in which the eyes are red, discharging, and often swollen;
2. Trachoma, in which the inner surface of the lids becomes rough and "granular."

Under treatment the first of these usually recovers completely and rapidly, but trachoma nearly always has a prolonged course, and often causes serious loss of sight or even blindness. It is trachoma which constitutes the really serious eye trouble in the West, though no doubt the acute conjunctivitis so common in the fly season is more spectacular in appearance. Much can be done, and everything possible should be done, to prevent the occurrence of both these diseases, but especially does this apply to trachoma, for not only is it the more serious disease, but it is the less highly infectious and therefore the more readily preventable.

Reasons for Prevalence.

The greater prevalence of conjunctival disease in the West is no doubt due in part to the dryness, glare, dust, and flies, factors which either render the eyes more susceptible to disease or, as in the case of dust and flies, carry the infective material to the eyes. The difficulty of providing an ample diet containing fresh milk, meat, fruit, and vegetables probably often lowers the natural resistance and increases the susceptibility to disease, and may thus also be a factor in the occurrence of trachoma, if not of acute conjunctivitis.

The essential cause, however, of both diseases is the occurrence and conveyance of the infection for, without this infection, people in the West have quite as healthy eyes as those dwelling nearer the coast.

Great Majority have Healthy Eyes.

In a recent inspection of school children in the South-Western districts about 80 per cent. were found to have eyes that would compare favourably with those of children around Brisbane. This shows that it is neither the climate, dust, nor glare that can be blamed for 10 per cent. suffering from trachoma, and that there is no reason why everyone in the West should not have as good eyes as people in other districts.

Actually some of the centres visited, not always those most favourably situated, were remarkable free from eye disease. Every place should be free.

Need for Care to Prevent Infection.

The frequency with which whole families are affected, one or both parents showing old-standing trachoma, while other families living in similar conditions have healthy eyes shows the care that should be taken to prevent the spread of the disease as well as the benefits to be gained by taking that care.

It is plainly the duty of everyone in those parts where trachoma is prevalent to take all reasonable precautions to avoid acquiring the disease, and it is especially the duty of those who are suffering or have suffered from trachoma to take unceasing care to avoid giving it to others.

Persistent care may be tedious and troublesome, but surely no trouble can be considered too great to get rid of a serious and disabling disease. Indeed, could anything be more discreditable to a community than the continued existence of a preventable disease?

Preventive Measures.

Of all requirements in discouraging the spread of infection from one to another we may put first and foremost soap and water. Scrupulous cleanliness—a general personal cleanliness as well as of the face and eyes—is all important. Children's faces should be washed as often as necessary, and not less than thrice daily.

The eyes should, if possible, be bathed with some simple lotion—such as boracic, a teaspoonful to a pint of water—thrice daily or as often as there is any discharge to be washed away. No dried discharge—so-called "sleep"—should be allowed to remain about the eyes.

Everything must be done to prevent the infection being carried from infected eyes to those that are not infected, and it must be remembered that it is by no means easy for any person not trained in eye work to know who may or may not be suffering from trachoma in a mild form.

Separate basins and separate towels, sponges, &c., are very important. One could hardly imagine a more likely way of spreading infection from one to another than the use of the same towel to wipe the face and eyes.

For a similar reason children should not share the same bed, for obviously infection would be likely to get from one to another either direct or on the pillow and bedclothes. All possible precautions should be taken to prevent flies conveying the infection. Fly-veils should be worn during the season when flies are prevalent. Children, particularly, must be taught not to tolerate flies in and about their eyes.

When sore eyes do occur a doctor should be consulted if one is available. It is very important that all cases of acute conjunctivitis, or "blight," should be thoroughly treated until the eyes are quite healthy again, for there is some reason to suspect that trachoma is especially liable to become established during and following an attack of acute conjunctivitis.

Treatment of Affected Eyes.

It is possible only to give general directions as to treatment where the services of a doctor are not available. It must be fully understood

that all sore eyes are not cases of acute conjunctivitis or trachoma. Many other eye troubles—sometimes very serious ones—are liable to be regarded as "blight" in the West or as "a cold in the eye" in other places, and these affections may require quite different treatment. Trachoma and acute conjunctivitis are both liable to complications requiring special treatment. The proper treatment for each case could only be advised by someone with a knowledge of eye diseases, and it is important that for any sore eye a doctor should be consulted, if possible.

For the usual simple case of conjunctivitis, whether acute "blight" or the chronic trachoma, treatment is directed chiefly to assisting Nature to effect the cure, for it is undesirable, without risk of damaging the eyes, to use the strong antiseptics that could be applied elsewhere, and only mild antiseptics and treatment are advisable except in the hands of those who know what they are doing and how to use them.

To help Nature in her own defensive process, the chief thing is to keep the eyes clean and free from any irritating and infective discharge. The eyes should be well bathed with boracic lotion thrice daily; when suffering from acute conjunctivitis or "blight" the eyes should be bathed more frequently—as frequently as there is any discharge to be removed. To help in destroying germs some mild antiseptic drops are desirable. Probably the common zinc sulphate ($\frac{1}{2}$ per cent.) and boracic lotion obtainable at any chemist's is the most efficient and safest for use where medical advice is not available, and two or three drops should be dropped into the eyes thrice daily after bathing with boracic.

It will be understood that in those places where children receive treatment through the kindness of the teacher this does not do away with the necessity of home treatment and care, for a treatment once daily on school days is not sufficient. Moreover, the welfare of a child's eyes is the responsibility of the parents, not of the teacher, though many teachers are kind enough to help in combating the eye troubles among their pupils.

For trachoma the possible home treatment is the same as for acute conjunctivitis, but must be prolonged—in most cases probably for two years or so. The disease is so resistant to treatment and so liable to lead to permanent injury to the sight that every effort should be made to get treatment under the best possible conditions.

Of no disease can it be more truly said that prevention is better than cure. There should be no trachoma to require treatment.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

"The Farm Produce Agents Acts, 1917 to 1932."

In the matter of a breach of the above Acts by Frederick C. Keehn, trading as Queensland Fruit Distributors, of Brisbane, in the State of Queensland, Licensed Farm Produce Agent.

Notice is hereby given that it is the intention of the Minister to cause the moneys or part of the moneys paid to His Majesty under the Bond given on behalf of the abovementioned on the commission by the said Frederick C. Keehn, trading as Queensland Fruit Distributors of a breach of the Acts to be paid or applied in making compensation to persons who have suffered damage by reason of such breach.

Any person having any claim in respect of such damage must produce his proof of damage to me not later than twenty-eight days after the publication of this notice.

Dated this twenty-seventh day of July, 1934.

W. GETTONS,
Registrar, Farm Produce Agents,
Department of Agriculture and Stock, Brisbane.

Plate 128.
Brisbane River at Colledge's Crossing, near Ipswich.

PLATE 129.
The Bremer, near Ipswich, Queensland.

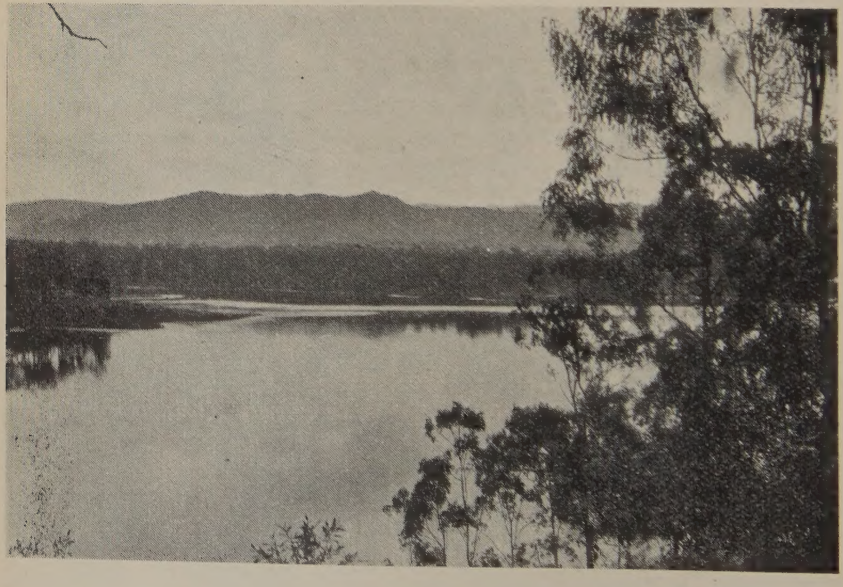


PLATE 130.
Lake Manchester, near Brisbane, Queensland.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JUNE, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June. 1934.	June. 1933.		June.	No. of Years' Records.	June. 1934.	June. 1933.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	1·62	33	2·74	2·83	Clermont	1·69	63	1·18	3·31
Cairns	2·84	52	1·71	4·23	Gindie	1·43	35	2·62	1·00
Cardwell	2·00	62	3·38	2·54	Springsure ..	1·76	65	3·04	1·79
Cooktown	2·02	58	0·20	1·79					
Herberton	1·11	48	2·73	1·73					
Ingham	2·32	42	3·83	3·30					
Innisfail	7·15	53	7·49	7·75					
Mossman Mill ..	2·13	21	1·02	3·17	*Darling Downs.*				
Townsville	1·32	63	2·39	3·88					
Central Coast.					Dalby	1·69	64	1·60	1·02
					Emu Vale ..	1·55	38	1·18	1·28
					Hermitage ..	1·85	28	..	1·26
Ayr	1·45	47	1·40	4·13	Jimbour	1·70	46	1·29	0·76
Bowen	1·61	63	1·75	2·89	Miles	1·82	49	1·67	2·11
Charters Towers ..	1·26	52	0·52	1·45	Stanthorpe	1·95	61	0·94	2·49
Mackay	2·63	63	4·03	3·02	Toowoomba ..	2·45	62	1·11	0·71
Proserpine	3·29	31	1·54	3·23	Warwick	1·78	69	0·64	1·39
St. Lawrence ..	2·50	63	1·56	1·45					
South Coast.									
					Maranoa.				
Biggenden	2·19	35	3·52	1·59					
Bundaberg	2·87	51	3·77	2·45					
Brisbane	2·75	83	0·76	1·37	Roma	1·60	60	1·06	0·94
Caboolture	2·78	47	1·46	1·42					
Childers	2·52	39	2·30	1·94					
Crohamhurst ..	4·65	41	1·60	2·00					
Esk	2·30	47	0·89	0·67					
Gayndah	1·83	63	2·54	1·00					
Gympie	2·72	64	1·44	1·84	*State Farms, &c.*				
Kilkivan	2·13	55	2·47	1·52					
Maryborough ..	3·06	63	1·49	2·28	Bungeworgorai ..	1·38	20	0·99	0·90
Nambour	3·89	38	1·35	2·44	Gatton College ..	1·90	35	0·79	1·03
Nanango	2·03	52	1·41	0·71	Kairi	1·37	20	3·13	2·33
Rockhampton ..	2·59	63	2·29	1·55	Mackay Sugar Experiment Station	2·34	37	2·47	3·53
Woodford	2·99	47	1·41	1·01					

J. H. HARTSHORN, Acting Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·96	79	69	84	5	61	25	20	2
Herberton	..	69	56	77	6	48	18	273	8
Rockhampton	30·12	74	54	81	1, 4	42	12	229	10
Brisbane	30·16	69	48	76	24	40	12	76	4
Darling Downs.									
Dalby	30·17	67	37	72	1, 23	27	11	160	4
Stanthorpe	..	59	30	67	5	17	9	94	4
Toowoomba	..	62	39	68	6	30	9, 28	111	4
Mid-Interior.									
Georgetown	29·98	84	58	89	23	48	11, 12	13	2
Longreach	30·09	75	47	84	4, 5	37	12	100	2
Mitchell	30·17	67	35	75	22	25	12	54	5
Western.									
Burketown	30·00	84	60	90	5	55	9, 13, 19, 27, 28	Nil	..
Boulia	30·08	73	47	86	21	40	19, 12	54	3
Thargomindah	30·15	66	43	78	14	34	10	98	5

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August, 1934.		September, 1934.		August, 1934.	Sept. 1934.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	a.m.
1	6·35	5·21	6·7	5·37	11·32	12·21
2	6·34	5·22	6·6	5·37	a.m.	1·17
3	6·33	5·23	6·5	5·38	12·33	2·9
4	6·32	5·23	6·4	5·38	1·30	2·54
5	6·32	5·24	6·3	5·39	2·27	3·38
6	6·31	5·24	6·2	5·39	3·20	4·14
7	6·31	5·25	6·1	5·40	4·10	4·46
8	6·30	5·25	6·0	5·40	4·55	5·18
9	6·29	5·26	5·59	5·41	5·37	5·46
10	6·29	5·26	5·57	5·41	6·10	6·14
11	6·28	5·27	5·56	5·42	6·42	6·44
12	6·27	5·27	5·55	5·42	7·14	7·13
13	6·26	5·28	5·53	5·43	7·39	7·47
14	6·25	5·28	5·52	5·43	8·9	8·28
15	6·24	5·29	5·51	5·44	8·38	9·15
16	6·23	5·30	5·50	5·44	9·9	10·9
17	6·22	5·30	5·49	5·44	9·47	11·11
						p.m.
18	6·21	5·31	5·48	5·45	10 29	12·16
19	6·20	5·31	5·46	5·45	11·18	1·23
					p.m.	
20	6·19	5·32	5·45	5·46	12·17	2·33
21	6·18	5·32	5·44	5·46	1·22	3·42
22	6·18	5·32	5·43	5·47	2·31	4·47
23	6·17	5·33	5·42	5·47	3·43	5·52
24	6·16	5·33	5·41	5·47	4·54	6·59
25	6·15	5·34	5·40	5·48	6·4	8·3
26	6·14	5·34	5·39	5·48	7·9	9·6
27	6·13	5·35	5·37	5·49	8·14	10·8
28	6·12	5·35	5·36	5·49	9·17	11·6
29	6.11	5.36	5·35	5·50	10·20	12·0
30	6·10	5·36	5·34	5·50	11·22	..
31	6·9	5·37			..	..

Phases of the Moon, Occultations, &c.

2 Aug.	☽	Last Quarter	4 27 p.m.
10 ,,	●	New Moon	6 46 p.m.
18 ,,	☾	First Quarter	2 33 p.m.
25 ,,	○	Full Moon	5 37 a.m.

Apogee, 9th August, at 7·12 a.m.
Perigee, 24th August, at 5·48 a.m.

The greatest astronomical event of this month will be an annular eclipse of the Sun on the 10th, to be seen best at Bulawayo, the largest town in Rhodesia, and at other places in South Africa where the ring of the Sun's face left uncovered by the Moon at the extreme phase will amount to only $\frac{1}{20}$ of its bright surface; thus permitting an annular eclipse to be seen to the greatest advantage if clouds do not intervene. As this will occur 1 hour 46 minutes after sunset at Warwick no glimpse of it will be caught in Queensland.

On the 1st and 2nd the approach of Venus to Mars will be noticeable. They will be apparently in the constellation Gemini, about 1½ degrees further north than Delta Geminorum, the star near which Pluto was discovered four and a-half years ago. Venus will be of much less brilliance than in March last and Mars far from its best.

The Moon will be passing from west to east of Venus, about 2 degrees on its northern side at 7 a.m. on the 8th.

Saturn will be in opposition to the Sun on the 18th, and will, therefore, rise very nearly at the time of sunset and set about the time of sunrise, thus being within reach of telescopes all night. The Sun's apparent movement eastward will soon bring about a change, causing Saturn to rise and set earlier, so that the earlier setting of Saturn will reduce its time of visibility by 27 minutes on the 31st.

The occultation of Antares, the principal star in Scorpio, will take place in broad daylight, about 2 p.m., on 19th August, but the Moon, being rather more than half full, high up in the north east by east, an interesting opportunity for amateurs with telescopes to find Antares on the eastern side of the Moon will be afforded.

The Moon will pass within 3 degrees of Saturn on its northern side at 9 p.m. on the 24th, but the Moon being all but full Saturn will scarcely be visible to general observers.

Mercury will be in superior conjunction with the Sun on the 26th, when it will be about 36 million miles beyond it, but not exactly behind it; Mercury then being about 1½ degrees more northward.

Mercury rises at 5.17 a.m. (1 hour 18 minutes before the Sun) on the 1st; on the 15th it rises only 35 min. before the Sun.

1 Sept.	☽	Last Quarter	5 40 a.m.
9 ,,	●	New Moon	10 20 a.m.
16 ,,	☾	First Quarter	10 26 p.m.
23 ,,	○	Full Moon	2 19 p.m.
30 ,,		Last Quarter	10 29 p.m.

Apogee, 5th September, at 4.6 p.m.
Perigee, 21st September, at 11.6 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.